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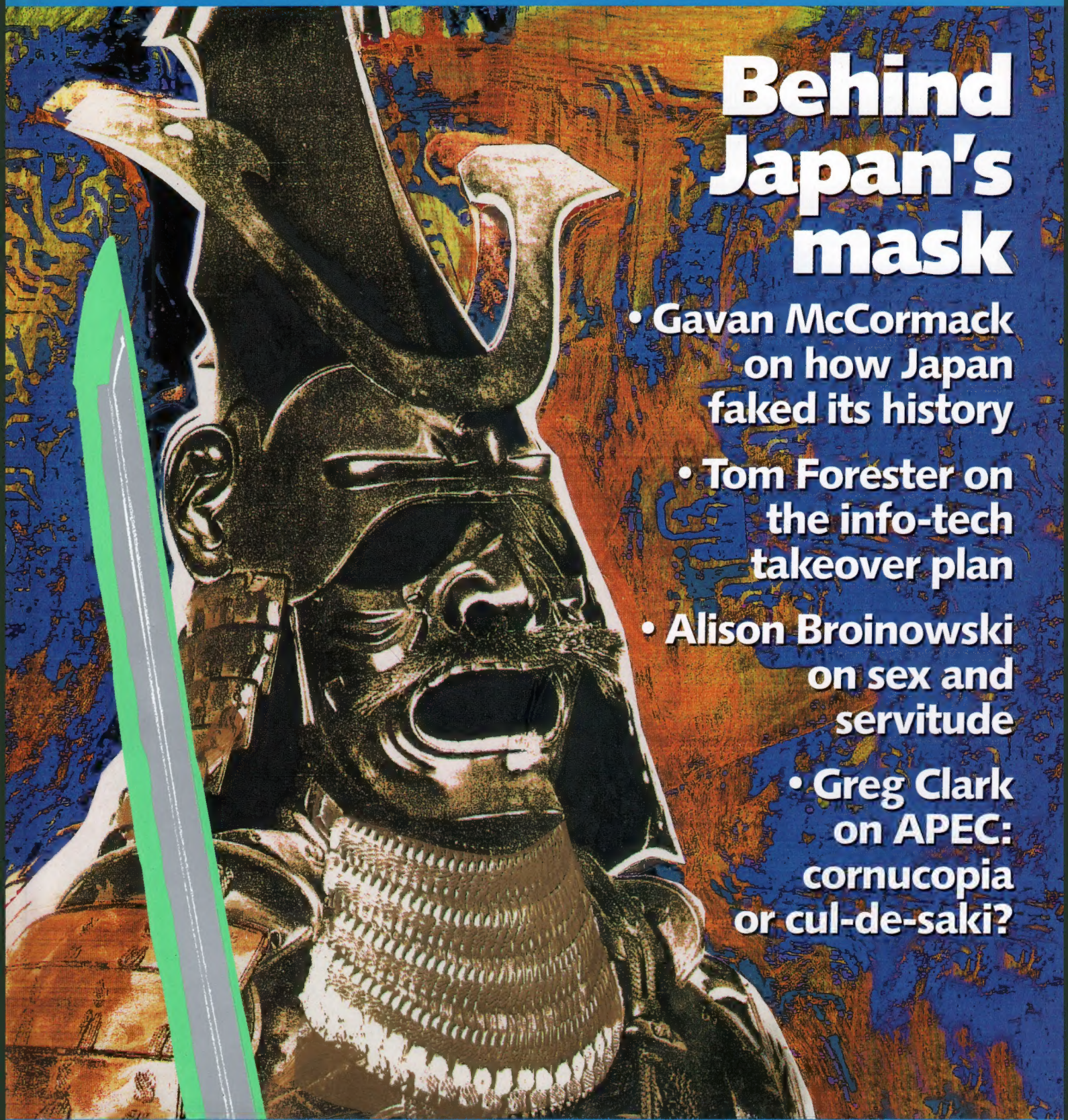
21C

Ro… workers
… modern
…ker's toolkit
Physical economics

Supercars, super headaches
Urban bush tucker
Sydney's nasty export



Behind Japan's mask

- Gavan McCormack on how Japan faked its history
- Tom Forester on the info-tech takeover plan
- Alison Broinowski on sex and servitude
- Greg Clark on APEC: cornucopia or cul-de-saki?

THE MAGAZINE OF THE AUSTRALIAN COMMISSION FOR THE FUTURE

Supporting education

Telecom Australia is supporting the AUSTRALIAN COMMISSION FOR THE FUTURE in sponsoring **21C** in to secondary schools throughout Australia. This issue of **21C** will be delivered free to secondary schools in South Australia and Tasmania. Past issues have gone to secondary schools in New South Wales and Victoria. Like the COMMISSION, **Telecom Australia** recognises the need for ongoing promotion of greater awareness about science and technology among children if we are to fulfil our future as a 'clever country'.

Telecom Australia is also committed to creating a sustainable future for Australia. For instance, Telecom is a major sponsor of Landcare Australia.

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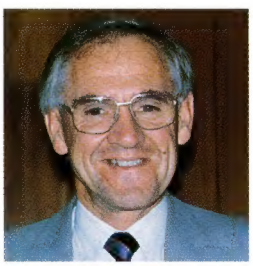

MESSAGE FROM HON JOHN BESWICK, MHA, MINSTER FOR EDUCATION AND THE ARTS, TASMANIA

Planning for preferred futures is a goal which we can aspire to with optimism and a sense of active purpose. The Australian Commission for the Future, through its magazine **21C**, has long provided stimulus for us all to view the future as something which we can in part create for ourselves.
Today's students will face a very different world just twenty years from now. It is important that the education they receive helps prepare them for an active and constructive role in 21st century society.
21C is a resource which will help provide a perspective for the future and I am pleased to be involved in making this copy available to all schools in Tasmania.

MESSAGE FROM HON SUSAN LENEHAN, MINSTER OF EDUCATION EMPLOYMENT AND TRAINING, SOUTH AUSTRALIA.

21C is food for thought.
It is a nourishing diet of information on education, technology, popular culture, science, arts and environment to name just a few of the topics being explored. The breadth and depth of the topics covered should satisfy the perceptive reader's appetite.
Take a user friendly writing style, put it in an attractive layout, add the main ingredients — thought provoking articles on a good variety of topics – and sprinkle a little vision on top, and you have the perfect recipe for a magazine to suit the most discerning tastes.
This formula can also be a creative recipe for education. Education is a life-long process requiring careful mixing of ingredients in order to produce quality opportunities for young people to develop to their full potential.
21C is a rich resource which should appeal to students of all ages.

21C

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Pre-press
Rus Littleson
Electronic Graphic Output Pty Ltd

Printing
Wilke Color

Distributor
Newsagents Direct Distribution Pty Ltd (NDD)
Tel (02) 693 4141 Fax (02) 669 2305

Australian Commission for the Future
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21C is the quarterly publication of the Australian Commission for the Future Ltd. All editorial enquiries should be directed to The Editor, **21C** magazine, The Australian Commission for the Future Ltd, GPO Box 1612M, Melbourne 3001. Telephone: (61) (03) 6633281. FAX (61) (03) 6633620. **21C** cannot accept responsibility for unsolicited manuscripts, transparencies, illustrations or other material. Subscription inquiries should be directed to the **21C** Subscriptions Department, **21C** Magazine, GPO Box 1612M, Melbourne 3001. ISSN 10256754. ACN 052348419. **21C** is published in association with the Australian Broadcasting Commission, ABC Enterprises, GPO Box 9994, Sydney, NSW, 2001.

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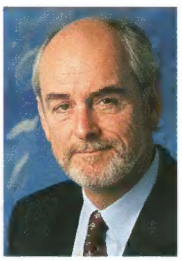
Cover: *Samurai*, **illustration by Kate Vanderstadt.**

PUBLISHER'S LETTER

John Jost



OVER the past two and a half years, **21C** has built a reputation for publishing new ideas and visions in a splendidly innovative way. This tenth edition of **21C** represents a shift in emphasis, towards simpler graphic presentation of more complex ideas and developments. In future, subject matter will come from the leading edge no matter what field, scientific, cultural, economic, artistic, social, technical, private or public sectors. The future of **21C** will be to publish authors who are the experts, the researchers, the people actually dealing with the issues and subjects in question.

This is not to denigrate journalists because journalists will obviously always be involved with **21C**. But the main role of the journalist in this magazine is to plan the contents, locate the expert, then professionally guide that person through the often difficult process of preparing material for readers. **21C** intends to apply an editing standard of the highest quality, for the benefit of writer and reader. As a magazine funded by the Government and the private sector, **21C** has an obligation to provide a deeper editorial coverage, to be a useful tool for people who need to know the range of endeavors in our nation that will shape our future, and for those general readers who buy **21C** because they find it interesting or useful in their lives.

Another aim of **21C** is to be a link between all sectors, government, private, the various bureaucracies, the education and research bases. By assiduously working to present the leading ideas and endeavors emanating from these sectors, **21C** will be performing a unique and valuable function for readers and advertisers. **21C** can be a bridge between the public and private sectors over research and innovative activity. It can also be a showcase of the best of Australian vision, intelligence and creativity and the practical application of these strengths.

This tenth edition of **21C** is the first stage of our plans. But our eleventh edition, to be published in November will be more ambitious. It will be a bumper 'double' edition. We will be reviewing several developing areas of importance with the help of the people who are driving the change: education and industry, what today's teenagers will be doing in 2001, sustainable development, a report from a leading medical researcher on the latest findings about the side effects of hormone replacement therapy, and a major review of what information technology is going to deliver to the average home over the next few years.

Meanwhile, good reading! ★

About this magazine

• In keeping with our emphasis on innovation, this "collector's" issue of **21C** has probably Australia's first eight eight color cover – the usual four color process, plus two metallics (gold and silver), a fluorescent and a UV varnish. This required a high degree of sophistication in the pre-production by Electronic Graphic Output Pty Ltd, and of course a high degree of excellence in the printing – by Wilke Color.

• **21C** now has Internet access. We have been connected via electronic mail to over 100 countries through the commercial service provider, connect.com.au; so if you want to drop us an electronic line, perhaps order a subscription or send a letter to the editor, our address is 21C.com.au -- see the publisher's imprint this page for all addresses.

More about Internet on page 17.

21C WINTER/SPRING 1993

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A. P. ABLONG
A treatise on the potential of information systems combined with massive computing power.

EDITOR'S NOTE

Don Hewett

NOBODY disputes the importance of Australia's relationship with Japan, but there consensus ends.

One school says we don't understand Japan; another school says that is just because the right people aren't asked. Statistics show that Australia has the highest per capita number of students of Japanese; but it is also said that, with rare exception, Japanese language teaching in Australia is 'notoriously bad'.

Statistics show we consistently have a trade surplus with Japan, and that the proportion of manufactured and processed goods is rising (nearly 30% of total exports in 91/92). Critics say we are being lulled into a false sense of security, that economic rationalist policies are no defence against an organised, protectionist, expansionist Japan targetting key industries for takeover, and that our aspirations for a special relationship will net us far less than a good dose of pragmatism, the sort practised by Japan's wary Asian neighbors.

So who is right? Or does the answer lie somewhere between? Readers of our special Japanese section will see a spectrum of opinion, and a depth of analysis that – while provocative, and in some cases controversial – reflects the views of people with a first hand knowledge of Japan, its people and its policies.

21C of course does not necessarily endorse the views we publish, but one thing is for certain – just as no Australian voter ever elected a US politician, it's wishful thinking to imagine that Japan, or any other nation, would subordinate its own interest to that of a trading partner. Witness Japanese negotiations over coal, iron ore and natural gas. Look at the virtual takeover of the lot fed beef industry. Look at the massive dominance in manufactured imports such as cars, videos, CD's and cameras.

The point about the Japanese that alarms many nations, even the US, is that they have a nationally co-ordinated strategy and a military attitude towards business, a sort of transmogrification of the samurai code. Their strategic plans for target industries, information technology for example, talk of encirclement and frontal attacks. In this scenario, 'level playing field' economic policies aimed at making our industries world competitive may be seen by Japan as an invitation to exploit its existing economic advantage.

How then will Australia cope with the need on the one hand to forge closer trading and regional ties with Japan, and on the other to remain a partner rather than a resources satellite, a mine and a market garden powered by the rising sun?

The sensible course is for Australia to have its own strategic plan, rather than wait for another country to make one for us.

The structure of such a plan seems to be evolving. The Federal Government has identified North East Asia as an economic zone of great contemporary and future importance, and is helping to set the Asia-Pacific agenda through the Asia-Pacific Economic Co-operation forum (APEC). It has also launched a potentially important regional development initiative to identify and develop Australia's strengths on a regional basis.

What else would this strategic plan contain? For a start, it would identify our national strengths, ones that could not easily be offshored. Agriculture, mining and energy resources are big base industries, offering wide down-stream opportunities. Manufactures, particularly elaborately transformed, software, and information services, are standout segments at the other end of the export spectrum, and there are many other niches in between.

We have the environment for creative thinking. Eventually Australia's strategic plan should provide the focus for that creative thinking, across the board, in all aspects of the economy, in virtually every business, large and small.

What's Next

Sustainable Development – fusing economic and ecological aspirations

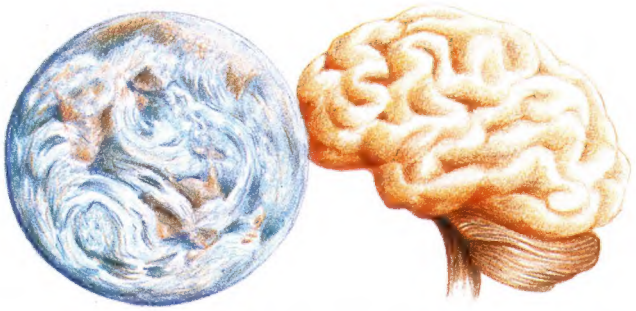
Global environmental consensus has recently merged bedrock ecological conditions with bottom line economic imperatives in the term Sustainable Development.

It is ultimately a question of balance, and there are tensions as competing viewpoints seek to shape definitions and agendas, but as a workable philosophy, Sustainable Development is powerful because it roughly equates economic and ecological concerns, and thus appeals to supporters of both development and conservation alike.

The concept is far from worked out in detail. The logic is unarguable – that any development should be sustainable, that it should not diminish the ability of future generations to enjoy life on planet Earth. In practice of course there are conflicts.

We will explore the dimensions of Sustainable Development, and its impact, in the next edition. It will be a 'must read' for anybody interested in business, industry, administration, resources, employment...and of course the environment.

Let's Give Some Thought To Our Environment



Separating Environmental Myth From Reality

Australians as a whole are becoming more concerned about our environment and many are prepared to make a personal contribution to its preservation. We only need to look at the rapid growth in popularity of recycling as evidence of this trend. But what else can we do? When searching for ways to be more environmentally responsible a lot of advice is available from friends, teachers, governments or the media.

But how accurate is this advice? If it isn't accurate could we be doing the environment more harm than good? or directing our resources, personal and monetary into activities which have little real effect? This article explores some of the current environmental "truths" in the areas of packaging and waste and tries to separate myth from reality.

A Quick Enviro-Quiz

How environmentally aware are you? Just give a "true" or "false" answer to the following questions - then read on. After finishing this article come back to see if you would change any of your answers.

	TRUE	FALSE
Recycling is the best way of solving our waste problems	☐	☐
Packaging makes up the largest proportion of what goes to landfill	☐	☐
If we could make industry pay for the waste produced by packaging we would all be better off	☐	☐
Burning waste is a waste of resources	☐	☐
Refillable packs are better than one way packs	☐	☐
Recycling saves money and resources	☐	☐
Packaging is wasteful and should be reduced	☐	☐
Society must aim for long term sustainability	☐	☐
Saving on landfill space is our highest priority	☐	☐

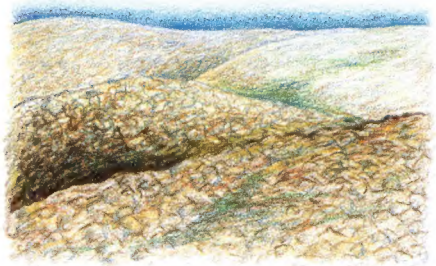
One Way - vs - Refillable Systems

Which is better for the environment, a refillable bottle or a one way pack? Before jumping to the 'obvious' conclusion, let's give the matter some more thought. In reality the environment benefits if the pack with the least environmental impact is used and that depends on a lot of factors.

Taking milk packaging as an example, we could compare a refillable glass bottle with a one trip milk carton. The first obvious difference between the two is their weight. The bottle is heavy and, apart from using more resources in manufacture, needs more energy to transport it. A carton, on the other hand is light in weight, weighing only 3% of the milk it contains. Not only does it use less material, it also reduces the energy used in transport.

A study on the subject by ANU's Centre for Resource and Environmental Studies in 1991 concluded, the total environmental impact of liquid food packaging was a very small proportion of total environmental problems and both approaches have benefits. More recently, the German government, after fixing the percentage of refillable containers to be used in milk packaging, commissioned a similar study by the prestigious Fraunhoffer Institute. This study concluded that the milk carton had an overall lower environmental impact than a refillable glass bottle.

Reporting on the Institute's results at a news conference the Chairman of Germany's Parliamentary Committee on the environment, Dr. Wolfgang von Geldern, said "we must put aside all of the prejudices we know and love. This new knowledge must now influence political decision making".



Packaging as Waste

For consumers the most visible form of waste is packaging waste. When asked most people would estimate packaging makes up a substantial portion of what goes to landfill. Estimates as high as 80% are given in response to surveys. The Industry Commission in its 1991 report on Recycling estimated that household waste makes up only about 30% of waste going to landfill, and about one third of that, or just 10% of the total, was packaging. In other words 90% of the waste going to landfill is NOT household packaging.

DID YOU KNOW?

That nearly one third of household waste we throw out is food and together with garden waste makes up more than half the rubbish thrown out by the average household.

Giving the matter some more thought we see packaging actually saves waste in other ways. A litre carton of orange juice leaves behind at the processing plant around 1.2 kg of orange peel which can be processed into other products such as animal feed or fertilizer - such a carton weights 30 grams and has actually saved 40 times its weight in waste going to landfill. Energy is also saved as only the juice and not the peel is transported to the cities where it is consumed. Similar savings in waste can be seen for frozen peas, tinned pineapple and a host of other packaged products.In fact a study by America's garbage 'archaeologist' Professor William Rathje which compares the waste thrown out by households in American cities with those in Mexico shows Mexicans use a lot less packaging but, as a result product 43% more waste per capita, mostly food scraps, vegetable peelings and the like. This is because packaged foods often only distribute the usable or edible part of the food.

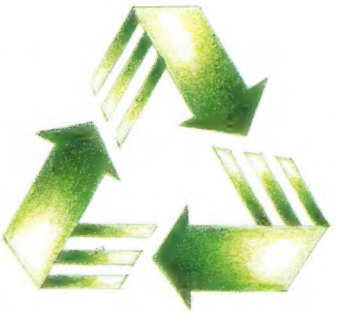
Another way that packaging saves waste is through its protective or food preserving qualities, e.g. a long life carton for milk or juice, prevents food wastage and avoids the need to refrigerate. But most importantly it makes food distribution more efficient saving the environment by reducing pollution due to transport. The environment also benefits through a reduced need for agricultural production.

Is Recycling Really The Answer?

Councils in most of Australia's major cities either have or are close to introducing kerbside recycling schemes which collect a range of materials such as cardboard and newsprint, glass, aluminium, plastics and milk and juice cartons.

DID YOU KNOW?

That packaging makes up less than one third of household waste or less than 10% of waste going to landfill?



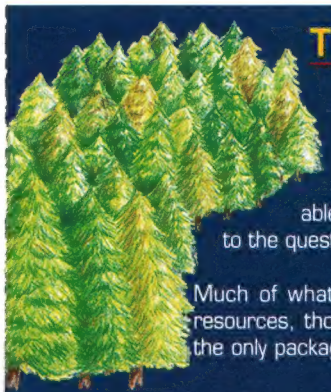
A recent study of household waste in more than 40 Sydney council areas by Recycle NSW showed some 27% of this was recyclable.

If we remember that household waste makes up about one third of waste going to landfill the maximum saving of landfill space through such recycling programs would be 9%. This assumes all recyclables are recovered. In fact the impact of such schemes is considerably less because not all households have access to recycling programs, many of those that do don't participate and even those who do recycle don't recycle everything they can. The combined effect of those three factors can reduce the real landfill savings by as much as half.

Clearly much more needs to be done.

Recycling Costs

Much of the early impetus behind recycling was the idea that, by diverting



The Importance of Renewability - The Forgotten Fourth "R"

How many times have you heard about the 3 R's - Reduce, Reuse, Recycle as a means of reducing society's impact on the environment on our way to a sustainable future. Not much thought has been given to the question of renewability as a desirable feature.

Much of what we produce comes from non-renewable resources, those that eventually will run out. Cartons are the only packaging for milk and juice that are made largely from renewable resources.

The paperboard used in cartons comes from the waste products of the sawlog industry which produces timber for housing and furniture. Trees are grown in sustainably managed plantation forests and for every tree harvested more are planted. This ensures a continual supply of material and an expanding area of forests.

Use of renewable resources for the goods we use is one way of moving towards a sustainable 21st Century.

waste from landfill the cost of garbage collection and landfill disposal could be avoided and save the community money. More recently some councils have taken the view that, if properly managed, recycling could pay for itself through the sale of collected materials and avoided disposal costs. With an increasing trend towards recycling worldwide, many of the materials collected are in over-supply and the prices paid for those materials have plummeted. We are now starting to realise that the cost of maintaining a comprehensive recycling program is considerably greater than taking that material to landfill. Recycling is not paying for itself. It is becoming a significant cost to the community.

Recycling also has environmental costs - it is not impact free. Recycling collections burn additional fuel and the reprocessing of collected materials have their own impacts, sometimes quite different from those associated with the production of new materials.

Authors of a study by the SA Centre for Economic Studies "The Economics of Packaging and the Environment" suggest many of the government policies relating to packaging and the environment could actually do more harm than good because they don't take these impacts into account. They claim recycling is oversold and careful disposal may be a better answer. A market is needed for recycled goods or the process of collection is wasted.

No wonder that the Industry Commission in its Recycling Inquiry concluded:

"The important question for governments and the community alike is not whether recycling rates in Australia could be increased but whether the community would be better off if they were.".

DID YOU KNOW?

That in many poorer countries as much as 50% of food is spoiled through poor packaging and distribution methods.
In China in 1982 60 million kilograms of eggs were smashed due to poor packaging.
Food waste in Australia is around 2%.

Other Ways With Waste

What else can we do with our waste. For the answer to that question we need to look at what actually makes up the waste stream and take a look at what other communities around the world have done with the different components of this waste stream.

DID YOU KNOW?

That in Lancaster County USA they actually 'mine' the local landfill, burning the waste along with waste collected daily in the Country to recover its energy.

Some countries, like Australia, emphasise recycling as a means of reducing waste. Germany is an example. Others take a balanced approach to waste management, employing a mix of solutions which include composting, waste to energy conversion as well as recycling and landfill.

Over 50% of our waste is green waste, (lawn clippings, tree trimmings, vegetable scraps etc.) which can be composted. The Dutch government has taken the view that the waste problem is best addressed by tackling this part of the waste stream and has passed legislation which will ban such compostable material from landfill.

Make Industry Pay

Some have theorised that if the environmental cost of packaging were to be included in the price of the package, then consumers, faced with the true cost of packaging, would use it less. A recent study by the S.A. Centre for Economic Studies estimates the environmental cost of packaging to range from 0.02 cents for an aluminium can to 0.9 cents for a one litre glass bottle. This confirms that the environmental impact of packaging is quite low.

As the cost of recycling rises there have been calls for recycling of pack-

Carton Recycling

All milk and juice cartons are collected throughout Australia through kerbside collection programs and drop-off schemes (Food Plus/BP Clean & Go in Sydney and Melbourne, Shell Service stations in Tasmania and all Recycling Centres in Adelaide).

Collected cartons are taken to APPM's Shoalhaven recycling mill where they are processed through a hydropulper which recovers the carton's paper fibres. These are sent to the paper machine and used to produce a range of recycled office and photocopying papers. A one litre carton can produce between 5 and 7 sheets of A4 paper. So when you recycle your cartons they could come back as the paper you use at home, school or in the office.

aging to be paid for by manufacturers. Such an approach is being tried in Germany where a levy is applied to every item of packaging to cover the cost of recycling. Averaging around 5 cents a pack this system will cost German consumers $9.5 billion a year by 1995 - saving just 5% of landfill space. The point is that any cost imposed on manufacturers is passed one through the price of packaged food people buy. Consumer pay in the end.

This method of funding recycling is inefficient and inflationary, and if used here could make Australian industry un-competitive. It also has unwanted consequences. Dr John Hatch and Dr Trevor Mules in their 1993 study of The Economics of Packaging and the Environment show through economic modeling that any tax or levy on packaging, including the cost of imposing an arbitrary recycling target, would depress the use of packaging. The economy would compensate either through increased agricultural production or through increased use of transport - both having a net negative environmental impact - the exact opposite of what was intended in the first place.

DID YOU KNOW?

That beverage cartons distribute over one billion litres of milk and juice each year, yet contribute less than 0.25 percent of waste going to landfill.

WASTE - A Burning Issue?

The Danes do it, the French do it as do the Swedish, Singaporeans and Americans. They burn their waste to recover the energy, often after removing some of the useful materials.

DID YOU KNOW?

Between 1912 and 1937 there were 65,000 deaths in England attributed to infection from milk. Between 1951 and 1980 there were just 4. Effective packaging was greatly responsible for the substantial reduction.

In Denmark the Amagerforbraendig plant services the cities of Copenhagen and Fredericksberg and converts to energy about 300,000 tonnes of refuse annually, generating 425,000 MWh of electricity. Three such plants, sited within the metropolitan area, service the greater Paris area's 10,000,000 people, generating energy in the form of electricity and steam to heat homes.

There are many such waste to energy plants throughout Europe and in the USA over 140 such waste incinerators have been built - Singapore one of our near neighbours burns 85% of its waste.

Modern waste to energy (wte) plants have sophisticated emission control systems to meet stringent government standards. They help conserve fossil fuels by replacing them with garbage as a source of energy. Those running wte plants say garbage burns cleaner because it has a lower sulphur content.

Currently some 20% of waste in the USA is burnt and the EPA there expects that to rise to 40% by the year 2000.

Burning waste to recover the energy makes sense in many ways. It is one way of recycling - instead of recycling the material in the waste stream its energy content is recycled. Whereas a relatively small proportion of the waste stream is recyclable, and some 50% is compostable, nearly 90% of waste is combustible.

Burning waste significantly reduces its volume and removes the health hazard associated with rotting garbage. What is left over can be used as clean fill or road base.

Perhaps we should follow Europe and the rest of the world into the 21st Century and look to recovering the energy trapped in our waste, avoiding future landfill problems.

For more information on carton recycling call: 0055 29 052
(25c for 43 sec) **or contact:**
Association of Liquidpaperboard Carton Manufacturers, P.O.Box 2572, North Parramatta, NSW, 2151.

Cartons And The 3 R's

How do the 3R's, Reduce, Reuse and Recycle relate to mil and juice cartons? Carton Reduce the amount of material needed to distribute milk and juice. A one litre glass bottle and cap weight nearly 400g. A one litre carton weighs just 30g. Not only does this represent a saving in materials, it also saves energy in transport and refrigeration.

Cartons can be and are being Re-used as tree planters. Using cartons to plant trees provides protection for the growing seedling. The carton itself eventually disintegrates. Cartons are also widely used in pre-schools and kindergartens as a craft resource.

All cartons can be Recycled. Recycling program are being set up around Australia to facilitate the collection of cartons for recycling into office and photocopying paper.

Only cartons have the fourth "R" - that of Renewability.

21C

Sir,

I respond to your Chairman's request for information about reasons for non-renewal. I was originally a subscriber but cancelled my subscription because:

• I find very shiny surface paper makes reading difficult, especially for old eyes;

• the format (paper size, etc) made the journal clumsy to handle and to deal with generally;

• the style of the journal seemed more appropriate to a mail order catalogue than a serious journal;

• the content seemed to me to give priority to the technological character of the future and generally from a favourably biased point of view – the technological future is far from attractive to me; and,

• generally too little attention seemed to me to be given to ecological, social and long term economic problems associated with contemporary change.

Further, I was disappointed in the intellectual quality of many of the articles. If there is significant change from the generally 'commercial' emphasis that I believe characterised the editions I read, I would be glad to consider re-subscribing.

H G Coombs
ANU, North Australian
Research Unit
Casuarina NT

Ed: We hope this is more like it, Nugget.

Sir,

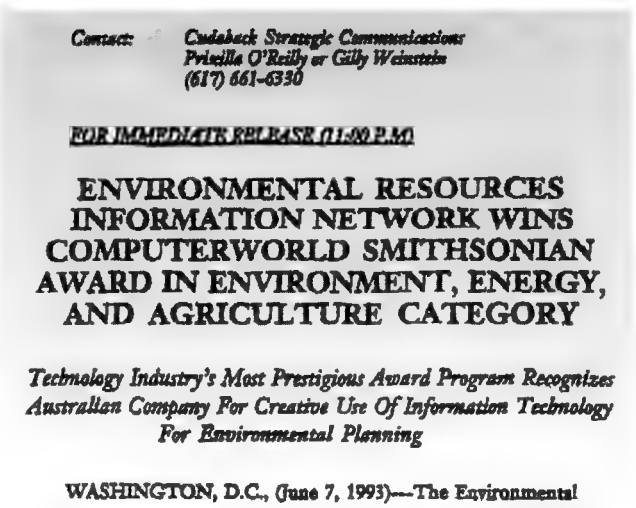
Yes! In your last letter wondering why I had allowed my subscription to lapse you revealed that you were changing to a smaller format. It was the size of the damn thing that put me off and, probably, I thought it was all to shiny and glossy – mind you, the waiting room clientele loved it!

Perhaps when I have seen your revised issue, I'll come back to the fold.

Pete Bent
Clifton Bends
Tasmania

Ed: Same goes for you Pete – and all the others who wrote strikingly similar letters urging a new format.

THE FAX



Contact: *Cudaback Strategic Communications*
Priscilla O'Reilly or Gilly Weinstein
(617) 661-6330

FOR IMMEDIATE RELEASE (11:00 P.M)

ENVIRONMENTAL RESOURCES INFORMATION NETWORK WINS COMPUTERWORLD SMITHSONIAN AWARD IN ENVIRONMENT, ENERGY, AND AGRICULTURE CATEGORY

Technology Industry's Most Prestigious Award Program Recognizes Australian Company For Creative Use Of Information Technology For Environmental Planning

WASHINGTON, D.C., (June 7, 1993)---The Environmental Resources Information Network's Information System application

see Next Briefs, page 21

NATURAL SELECTION

Sir,

In teaching the History of Darwinism, I tell students that natural selection displaced religiously inspired concepts of nature that situated the human species at the pinnacle of creation, as the object of divine providence. Darwin gave us instead the notion of nature as a blind watch-maker, remorselessly generating and destroying species without a hint of purpose and with untold suffering. The watchmaker is not only blind, it is an idiot.

What shall I say now that Derek Denton (**21C** Issue 9) has situated human consciousness at the pinnacle of evolution while claiming a Darwinian pedigree for this audacity? Classify him with Tielhard de Chardin, hungry for the Noosphere of higher Evolution where the lamb no longer fears the lion? Or palm it off as popularisation? Loss of nerve perhaps?

But I jest. One agreeable things about Darwinian theory is that with skill and imagination, you can make it mean whatever your heart desires. Leading scientists have made it validate or refute sexism, racism, nationalism, world peace, the arms race, population control, abortion, eugenics, and innumerable nihilist, humanist, religious, tragic, existential, and romantic interpretations of the meaning of life.

So, if Denton prefers to close his eyes to the evil day when the pinnacle will be toppled, and every trace of its doings be lost for all eternity, why not? Pessimism is bad for digestion.

Prof Hiram Caton
History and Philosophy
Griffith University, Q

REPUBLIC

Sir,

It would be unthinkable to any British citizen to have a head of state who is not born there and does not live there permanently. Any person appreciating the British system of justice would never deny the same privilege to Australians.

Therefore, Australians deserve also a head of state born here, an Australian citizen, not with dual or triple citizenship, permanently living here, elected democratically by the majority of Australians, and respecting only our national flag – 100 per cent Australian, not obscured by a foreign flag.

The British people must be proud of their flag. The same goes for Australians. However, this country is not Britain and Australians are not British. This is Australia, we are Australians, and our flag is the Southern Cross and nothing else.

The British must be also proud of their heritage. Our heritage is Australian (remember Eureka?), and we must be proud of ours.

In short, in Britain the people should remain British and not to try to become Australian, and here we should proudly remain Australian and not try to be British.

Jim Dimo,
Coominya, Q

Darryl Ribaux

Body building

Surgeons can implant new internal organs, prosthetic limbs, take years off a person's face, kilos off thighs, put the heart of a baboon into a human body and even change genders. By medieval standards, surgeons are already playing God.

TWENTIETH CENTURY technology is redefining what can be done with our bodies, blurring the distinctions between the artificial and natural, 'creating' a synthesis of organic and non-organic unlike either parent – human or machine.

Throughout history, there have been religious taboos on how much science could interfere with the human body, which was after all God's creation, a vessel for the soul. Science gradually secularized the body and made it a legitimate object of study. Today our body parts are becoming consumer items, objects of concern for what Christopher Lasch calls the narcissistic personality structure that has emerged in contemporary society, for instance new and better eyes, breasts and hands. The demand for instant gratification means that those who cannot wait to reconstruct themselves in a gym can instead buy instant pectorals – silicon enhanced of course.

Not only is there cosmetic remodelling and artificial parts, there is the human spare parts trade, with the financially poor selling parts of their bodies: Gypsies selling their bone marrow, Turks being bought to England to sell their kidneys so that those that can afford it can renew themselves, a practice that has been condemned by the World Health Organisation and the Transplantation Society of Australia and New Zealand.

Many now consider cosmetic surgery to be an art form and the cosmetic surgeon an artist. Because it is cheaper now, more image-conscious people are taking up the option of cosmetic surgery. Cosmetic surgeons practise what many call body remodelling. The art of the possible is long; ears can be trimmed, chins readjusted by bone realignment or with a silicon implant, noses, lips and eyes reshaped, breasts reduced, 'enhanced' or lifted, nipples re-positioned. Liposuction will remove localized body fat which can itself be injected under the skin somewhere else to smooth out lines and give the face a lift. Outer thigh and underarm fat can be cut and removed and the stomach can be resculpted. Facial skin can either be planed or chemically peeled away.

Cosmetic surgeons are not the only ones to utilize the new technological possibilities. Orlan, a French performance artist who was in Sydney for the recent Biennale has undergone cosmetic surgery and plans to undergo a further series of 'surgical interventions' to achieve 'The Ultimate Masterpiece: The Reincarnation of St Orlan' – a project in which various parts of the artist's body are resculpted to form a synthesis of various models of feminine beauty such as the Mona Lisa and Botticelli's Venus – not, she says, to become younger or more beautiful, but to effect a metamorphosis. The artist records the performance on video camera and helps finance her operations by selling samples, body fragments, the 'software' of the old Orlan.

Most cosmetic surgery consists of cutting, disposing and reshaping what is already there. There are some prosthetic procedures, such as silicon and/or collagen implants for the nose, breast and chin, but the use of high-tech prosthetics is more pronounced in other reconstructive surgery. Prosthetic reconstruction, apart from that used for cosmetic reasons, is non-elective. People do not choose to have a prosthetic arm or leg. If cosmetic surgery is a major part of the attitudinal change to our body, it is prosthetic techniques and materials, for reasons of necessity, that are meshing machine with human.

A prosthesis can be many things, perform many tasks: it can keep your heart functioning via artificial heart valves or a plastic pacemaker; it can help you hear or enable walking via a new hip joint, artificial foot or leg. It can even help you attain an erection with the help of a penile rod implant.

PROSTHETIC reconstruction has been utilizing metal and alloy materials for many years. Recent developments have seen the introduction and development of polymers, such as polyethelyne and polyurethane, and ceramics like alumina, as materials for use in reconstructive surgery. Ceramic material such as Bioglass forms a direct chemical bond with bone and soft tissue to overcome the problem of meshing inorganic material with the human body. The join that the implant forms duplicates the one between muscle and bone. Silicon, the base material of the computer chip, is also used in prosthetics for the human body in the form of silicon implants.

Research is now being done on electrode implants which may result in an electronic eye that will give vision to the blind. The reality of optical prosthesis at the moment though is that they are used to compensate for a loss of volume, whether it be a part or the

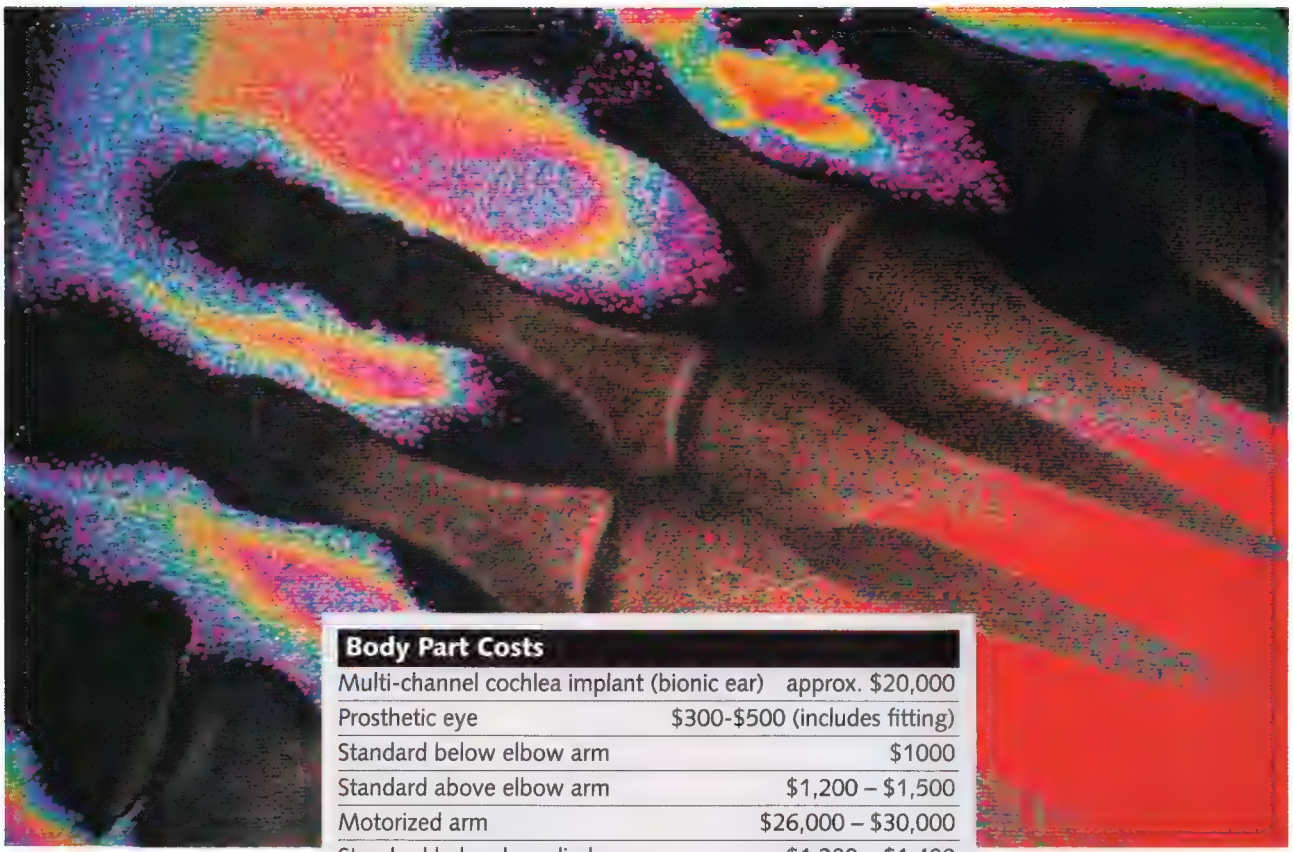


ILLUSTRATION: STUART MCCORMICK

Body Part Costs	
Multi-channel cochlea implant (bionic ear)	approx. $20,000
Prosthetic eye	$300-$500 (includes fitting)
Standard below elbow arm	$1000
Standard above elbow arm	$1,200 – $1,500
Motorized arm	$26,000 – $30,000
Standard below knee limb	$1,200 – $1,400
Standard above knee limb	$2,200 – $2,500
Hydraulic knee unit	up to $10,000
Energy storing foot	$800+

whole of the eye. Prosthetic eyes, once made of glass, are now made of acrylic which can be easily polished and do not break.

Another type of optical prosthesis is made of coral, which is specially treated and surgically implanted. The muscles connect to the prosthesis through the holes in the coral. Once connection has occurred, a hole is drilled through the eye and a peg inserted which allows for very sharp and accurate movement.

ANOTHER AREA OF reconstructive surgery is limb prosthesis. Artificial limbs were originally made of wood, then polyester and acrylic resins. Now carbon fibres are being used to achieve a lightweight, flexible but strong limb. Limb prosthesis come in two parts – the custom made component that attaches to what remains of a person's limb and commercially available componentry which fits into that.

One area of development in lower-limb prosthesis is the energy storing foot. Mr Don Radmore, Chairperson of La Trobe University's Division of Prosthetics and Orthotics explains: "When a person lands on their feet it stores energy, when they take off the energy is released. More correctly, they're either shock absorbing or energy transferring components – they allow a smoother gait cycle as you walk. A lot of prosthetic technology is to minimize the amount of energy used."

Another developing area, according to Mr Radmore is camouflage prosthesis: "You can get spray can coatings that come out with a skin-like finish and then you can achieve the appearance of hairs and veins. Skin colors can be made to match so that you can put an ear on somebody and you cannot notice the difference."

A hearing prosthesis developed by the University of Melbourne is a device that probably best illustrates machine/human interactive possibilities. The cochlea implant is used by people who have profound or total deafness. John Huigen of the University of Melbourne Department of Otolaryngology and the Australian Bionic Ear and Hearing Research Institute outlines how the device works: "The implant is an electrode array which consists of twenty two bands of electrodes that are inserted up the cochlea.

"Electrical energy is pumped through those electrodes which causes an electric current that directly stimulates the hearing nerves. The electrode array is attached to a bunch of electronics which is implanted in the bone behind the ear. The implanted part has an antenna which transfers over the power and digitized information as to what electrode to stimulate, and this is attached to a speech processor which extracts the particular parts of speech

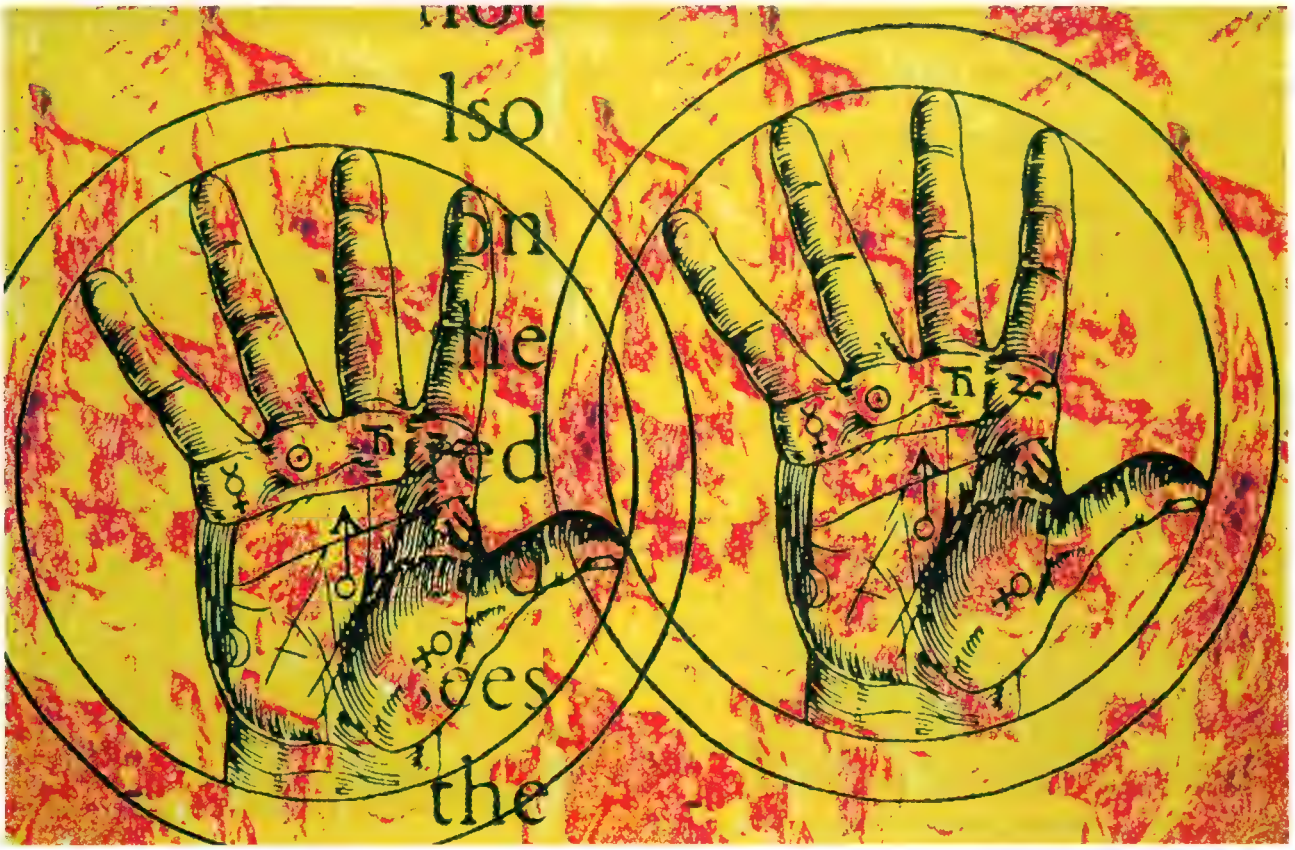


ILLUSTRATION: STUART MCCORMICK

which are important. This is then coded to stimulate the correct electrodes."

So how possible is the bionic man or the cyborg of science fiction now? Well if the practicalities rather than the theoretical possibilities are examined then we are still a long way from the meshing of human and machine that will result in the type of interface between human and machine that exists in films such as The Terminator.

Don Radmore argues that while you may well have below-the-knee amputees running the 100 metres in eleven or twelve seconds on a prosthetic limb, this is not possible for everyone. The technology may be too complicated for particular people to utilize: "Realistically, prosthetic devices are limited at the most to either two or three responses. Open or close for a hand and maybe something else. If you want elbow, wrist and hand movement, probably the most you can get is elbow movement and opening and closing of the whole hand rather than individual fingers. Some of these devices are very clever but still not at the stage where they are really user-friendly."

WHILE THE IDEA THAT we can create eyes and limbs that do a better job than the ones we have now might be exciting, it does overlook the fact that people are very attached to their body parts. The major concern of the field of prosthetics is to replace something that has been lost. People who lose limbs go through a grieving process similar to that of bereavement. The fitting of an artificial part doesn't alter that. Even if 'better' parts can be manufactured in the future, who will be prepared to forego what they already have in order to be fitted with them?

Maybe our new information environments will demand a redesigning of the human body and we may well need technical aids, new and different eyes or hands, to enter things like virtual space. It is most likely that any new 'improved' body parts will come from the field of robotics. For example, Japanese development of a microchip which processes optic signals for use in robotics will probably result in spin-offs for optical prosthesis later on for humans, providing of course an interface with the optic nerve system can be achieved.

While we are not at the stage of the cyborg yet – and may never get there – it is the logical conclusion of developments in body reconstruction. We will have to find answers to questions such as Is it still me? and what it is to be human in what Hans Moravec has called the post-biological age. If a body can be replicated or be even sixty percent synthetic prosthesis, then we have to make decisions about the criteria of human-ness. If the body is not the criteria for being human, then we have to turn to our memories, feelings and thoughts as defining characteristics. The body, whatever it is made of, then becomes a support system for our 'human' attributes. ★

PLAYING TAG WITH LITTER

by Peter McKay, Maree Marshall and Dr Leon Collett Catchment Strategy Division, Melbourne Parks and Waterways

The presence of litter on our streets, beaches and in waterways is a serious problem with amenity, health and economic consequences. In Victoria, removal of litter from streets, waterways and beaches costs the community in excess of $50 million a year.

While litter problems are largely the result of individual behaviour, past street and drainage design, along with some municipal street cleaning practices, make the litter management problem worse by rapidly transporting litter into waterways and Port Phillip Bay. Litter is often stranded in the vegetation which fringes natural stream banks or comes to rest on nearby beaches.

The way in which the drainage system transfers litter from the suburban street to the nearest waterway and so to the Bay, is not generally understood by members of the public. Informing the community about the direct connection between street drains and our waterways is therefore a first step in reducing the unsightly impact of litter.

The **Tagged Litter Study,** conducted recently by Melbourne Parks and Waterways, provided some insights into the nature of litter management in the greater Melbourne area.

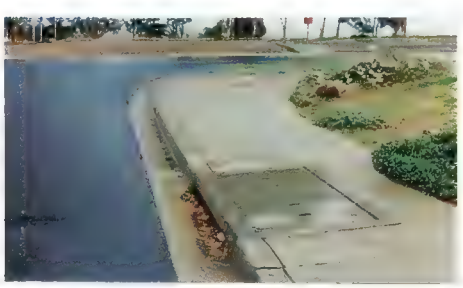
The aims of the **Tagged Litter Study** were:

- to better understand the relative contribution of the various suburban drainage networks to the quantity of litter on our major waterways and bayside beaches. We expected that this additional information would help to focus litter management efforts at the municipal level;
- to evaluate the effectiveness of litter trapping devices and to estimate the number of litter items passing the traps;
- to provide a practical demonstration to the public of the direct transfer of litter to our waterways and the Bay through the drainage system.

The tag on a polystyrene hamburger clam.

For the **Tagged Litter Study,** 1307 litter items were marked with brightly coloured, individually numbered labels or tags. These tagged items were inserted in batches of between 20 and 50, into the drainage pits in street gutters at 30 suburban locations in the greater metropolitan area from Frankston to Geelong. All tagged items were 'launched' in September, 1991. Following moderate rain in the area, the tagged items were transported rapidly through the drainage system together with many tonnes of other litter items, into the nearest waterway or directly to the Bay. As tagged items were found by members of the public and the location of the finds reported, a "picture" rapidly emerged of the behaviour of litter items in the drainage system. To date 629 tagged items (48%) have been recovered.

The start of the trip ... a suburban street drainage pit.



MELBOURNE
Parks & Waterways

An enterprise of the Melbourne Water Corporation

WHEN YOU RUBBISH OUR STREETS YOU RUBBISH OUR RIVERS ... AND THE BAY.

The **Tagged Litter Study** found that:

- Over 5 million large buoyant litter items (including drink bottles, hamburger clams, foam plastic cups, plastic bags and the like) are discarded onto streets where they add to the suburban litter problem and spoil the natural beauty of our waterway and the Bay.
- Probably as many large but less buoyant litter items (such as glass bottles, cans, plastic sheeting etc.) also end up in the waterways and the Bay.
- The 360 plus drains which discharge directly to the Bay (rather than to a stream or creek) are responsible for transporting the majority of litter from our streets to our beaches.
- In particular, the south-eastern suburbs of Melbourne which drain directly to the Bay generate about 80% of the litter which ends up on bayside beaches.
- The main sources of litter are suburban shopping centres.
- Stream-side vegetation traps lots of litter in waterways (especially in the Yarra River and its tributaries) and prevents its passage to the Bay.
- Tidal movements and wind effects in the lower Yarra deposit most Yarra catchment litter onto the sandy banks of the river near the Westgate bridge and Port Melbourne, thus "protecting" the Bay.
- Though effective at trapping floating objects, litter traps become less efficient as they clog up.
- Packaging associated with cigarettes, confectionary and fast-foods account for about 80% of suburban litter.
- Many tonnes of garden rubbish, urban waste, leaves and sediment are mixed up with suburban litter.

A hundred years ago, the drainage system was designed to transport waste away, so as to keep the suburbs healthy. It was socially acceptable then to dispose of rubbish and other pollutants in the street gutter. Today you still see shopkeepers sweep footpath rubbish into the gutter and ordinary people drop fast food containers, food scraps and cigarette litter onto the street.

Apparently many think littering is still socially acceptable, but in fact littering is very un-Australian.

Source control is the only way to deal effectively with litter. But effective source control calls for a change in the way people behave. A useful supporting initiative would be the installation of litter traps on drains by local municipalities.

Is it too much to hope that the end of the century could see us litter free?

A drain litter trap.

Here are some examples of journeys completed by litter items:

- An orange juice bottle launched by primary school children in Fletcher Street, Moorabbin arrived on Dromana Beach 13 days later – a journey of 60 kilometres.
- In August 1992, an orange juice bottle launched in Church Street, Hawthorn arrived on Safety Beach, Dromana – a journey of about 70 kilometres taking some 11 months.
- On 4 September 1992 a soft drink bottle was found at Safety Beach. This bottle had been launched by St John Bosco school children in Muriel Street, Niddrie on September 16, 1991 – a distance of 85 kilometres in twelve months.

For further information on the **Tagged Litter Study,** or a copy of the report, please telephone 615 4208.

MELBOURNE WATER

JWT HDH 005.

...we're already working on it.

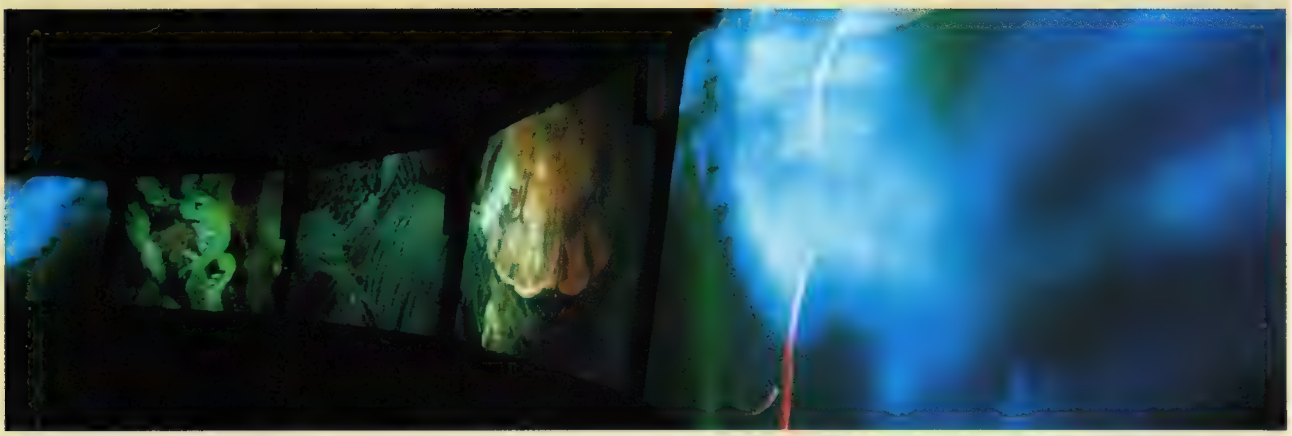
- Computer systems and products.
- Test and Measurement instruments.
- Medical and Analytical equipment.

HEWLETT PACKARD

A Better Way.

Joanne Painter

Multi-sensor theatre a world first



The world first multi-sensor cinema opened recently in the Melbourne's Southgate arts and leisure precinct. Besides a computer-driven, hi-fi smell system, the cinema features a sense-boggling armoury of surround sound, special effects, video, computer animation and slides.

Australian designed and operated, the Sensor Vision Theatre is being promoted as a revolution in cinema. Theatre manager, Ms Marita Davidson says the technology comes as close as possible to creating a total sensory experience for the audience.

The current screening (the 50 minute *Experience Australia* by Marcus McCartney, Bogdan Zylinski and Trevor Darby) includes the sights, smells and sounds of our 50,000 year history. At particular moments in the script, the air in the theatre is tinged with the smell of exploding gunpowder, sea winds or damp rainforest. Temperature and humidity change accordingly. In one scene smoke pours from behind the screens.

Sensor Vision Theatre is the brain child of Italian born publisher Rosario Scarpato who spent the past 18 months designing and building the system with the help of a talented production team.

Mr Scarpato says the key to sensor vision is a combination of special effects, involving four of the five human senses. Wide screen imagery and multi-channel digital sound are used in conjunction with computer controlled systems, which introduce aromas and changes in temperature and humidity. An elaborate network of pipes unobtrusively deliver the smell.

Ms Davidson said audience response was very exciting. "A lot of people enjoy the smell aspect of the show. We had one person who had been caught in the Ash Wednesday bush fires and they said our bush fire sequence was very accurate."

The five screen Multi-sensor theatre at Southgate

After screening to packed audiences in Melbourne, staff at Sensor Vision are looking at expanding to Sydney and eventually other cities.

For more information and details about screening times, call the Sensor Vision Theatre on (03) 690 9800. ★

Commercial connection to Internet

For many years, academic and research communities have enjoyed access to a worldwide computer network called Internet. Currently the world's largest network, Internet comprises over 1.7 million computers and is used by over 15 million people in 110 countries, including an estimated 500,000 in Australia.

New computers are being added to the Internet at the rate of 10 per cent per month, and this rate is expected to increase for at least the next five to ten years. (Among the new computers are those here at 21C – see page 1 for our new electronic address.)

The Internet is represented in Australia by AARNet, the Australian Academic and Research Network, which was established in 1990. AARNet is managed by the Australian Vice-Chancellors' Committee to provide common data communications services to the Australian academic and research sector.

Unfortunately, commercial access to AARNet has been hampered by the lack of a commercial gateway service, as AARNet's stated intent is not to provide services to end users.

To fill this gap, as well as to provide an independent commercial network service, a commercial connection service called connect.com.au pty ltd was formed in 1992. It provides dial-in, or leased-line access to AARNet and the Internet for commercial organisations and individuals. Connect.com.au now has hubs in Melbourne, Sydney, Canberra, Perth, Adelaide, and Brisbane, with high speed ISDN links connecting the hubs and forming the gateway to AARNet. All access to connect.com.au is protocol based; they do not offer interactive access. They currently support the protocols: uucp, SL/IP, and PPP. Access is via intermittent or permanent modem or ISDN connections.

Connect.com.au is also happy to carry interstate traffic over their network as an alternative to installing point-to-point links around the country. For further information contact (03) 528 2239.★

Jenny Brown

Babies benefit from womb video

A Melbourne obstetrician has developed video surveillance technology for near-term foetuses inside the womb.

If control trials confirm Mr Kevin Barham's own clinical findings, the device could have a significant impact, not only on the death rate of babies at risk, but also in reducing the need for caesarean sections.

Mr Barham, senior obstetrician and gynaecologist at The Mercy Hospital for Women, East Melbourne, has been working on the transcervical omniascope for several decades.

The invention has been put to the test on patients in his own practice with impressive results – no babies were lost from a group selected because of their high mortality risk.

Unexpected mature-weight death rate in Victoria (intra-uterine Sudden Infant Death Syndrome) is currently 1 in 1,500.

Mr Barham said that his device takes the guesswork out of the birthing process and serves to reassure expectant parents and their doctors.

The omniascope may be introduced into the vagina with little danger of infection or patient discomfort at the 36 week stage of the pregnancy. It allows a sequence of individual tests providing information about the health of the foetus and the conditions of the "amniosphere" – the foetus, the amniotic fluid, membranes and the decidua of the lower uterine zone.

The omniascope feeds a visual image of the amniosphere directly onto a television screen thus allowing an objective assessment of the fluid environment of the foetus. Foetal compromise or stress is often indicated by an obvious drying up of the fluid, or by the presence of meconium (foetal bowel discharge).

The introduction of light into the womb – the first light the foetus has ever experienced – also provides data and has resulted in some unexpected benefits.

Mr Barham said that it has caused some breech presentation babies to re-orient themselves in the womb and babies, in danger of pressing on their own umbilical cords, "to jump off it".

Intra-uterine light also has a photo-therapeutic effect, Mr Barham said. In healthy babies it causes a measurable movement response and a heart rate acceleration.

If, however, the foetus is not getting enough nourishment or oxygen, it is non-responsive and the heart rate may decelerate again indicating a baby at risk.

The data (cardiotocographic or CTG and real-time ultrasonographic) are video encoded using technology developed by the Bio-Medical Engineering Department at the Royal Children's Hospital Melbourne and adapted by Mr Richard Newman. It is transmitted directly onto VCR and can be shared with parents immediately.

Mr Barham says that in 20 per cent of the tests run, he has discovered sub-clinical findings of which he would otherwise have been unaware.

Though the omniascope has taken years and $140,000 to develop thus far, Mr Barham only unveiled it publicly at the recent Annual Conference of the Royal Australian College of Obstetricians in Hobart. He said it came as a "cultural shock" to the gathering.

Mr Barham said that at about $100,000 per unit, the omniascope costs far less than state-of-the-art ultrasound equipment ($300,000). And he anticipates that as more units are developed the price will come down, making it feasible for every major obstetrical hospital to have one.

Mr Kevin Barham may be contacted on (03) 417 6560.★

Snapshot

Key industries for the Asia Pacific region in the 90s

AUTOMOBILES: From 33% of 43 million global units in 1986 to 40% of 63 million units by the year 2000 with 12% of these in developing Asia (from 2% in 1986)

CHEMICALS: 40% of world growth in chemicals' consumption projected for Asia.

PAPER: 50% of world growth.

ELECTRONIC Assembly: 60% of world growth.

TOURISM: 35% of world growth this decade. Indeed by 2010 half of all air traffic will be either to, from or within Asia.

TELECOMMUNICATIONS: Growing regionally at 20% annually. Regional demand has currently reached US$20 billion a year equal to the size of the North American market. The market penetration of telephones in the region however, is still only one-eighth the American level and one-sixth the European level.

Source: 1992 *Pacific Rim Forum*, San Diego, California.

Joanne Painter

Bush tucker: old cuisine, new fad?

For more than 40,000 years, Australian aboriginals survived on a diet of plentiful and nourishing bush tucker.

Yet until very recently, Australian cuisine all but ignored the culinary and nutritional value of indigenous foods.

Australia has already given the world some distinctive foods. The macadamia, is indigenous to Australia. So too is the quandong, which is gaining markets in the USA and Europe.

Both products, however, had limited commercial success in Australia. Macadamia growers didn't crack the international nut market until very recently, and then only after the Americans had established commercial dominance through their vast plantations in Hawaii.

To help avoid further lost opportunities, a new crop of bush tucker products is being put under the microscope by scientists from the CSIRO.

Dr Bob Lawn of the CSIRO's Division of Tropical Crops and Pastures and Ms Alison Cottrell of the University of Queensland have been conducting research into some little known Australian relatives of the mung bean.

The *Vigna* genus is found in Africa, Asia and the Pacific. Scientists believe the five native Australian varieties prevalent in Aboriginal diets are a treasure trove of genetic information. Properties of the *Vigna lanceolata* include hard-seededness, high seed protein, disease resistance and convenient flowering times.

These are valuable envi-

IT goes bush

PHOTO: RON ROBERTSON

Juleigh Robins, of Robins Food Store, Toorak Road, Melbourne, Victorian distributor for Bush Tucker Supply

ronmental traits in a country often afflicted by drought, disease and climatic variation.

The native beans are also incredibly adaptable, ranging from the tropics to the sub tropics and from coastal to arid desert areas. Unfortunately urban encroachment threatens this potentially lucrative resource.

The wild mung bean (*Vigna radiata)* has numerous attributes including a remarkable ability to survive in saline conditions. It is also hard-seeded, a genetic trait with valuable applications to modern domesticated beans.

Researchers believe genetic characteristics of Australia's five Vigna species could be bred into modern cultivars to improve salt tolerance, drought adaptation and boost forage harvests. Environmental uses for the mung bean include beach protection and dune stabilisation.

Adapting bush tucker to the needs of modern agriculture and diet is nothing new to Vic Cherikoff and his staff at Bush Tucker Supply in Sydney. For the past six years they have been slowly bringing bush tucker in from the desert, forests and plains to the finest restaurant tables in the land.

Jo-anne Gregory, a research and development officer with Bush Tucker Supply, believes bush tucker will be an integral part of our diet next century.

"It is a really exciting area and it can only move forward from here. There is no reason why the whole world won't eventually eat bush foods," she said.

The company recently held talks with Qantas and Cathay Pacific airlines, who are investigating incorporating elements of bush tucker into their Australian menus. In fact meeting demand is an ongoing challenge for bush tucker suppliers, as more and more restaurants experiment with uniquely Australian foods.

According to Ms Gregory, bush tucker has numerous advantages over introduced food stuffs. "It is more nutritious because it has a higher fibre content and tends to have higher satiety levels (the feeling of fullness). Without being too pessimistic, there are a lot of attitudinal changes needed so it will be a long, slow process of change. But change will come."

Problems associated with commercial exploitation of bush tucker include the unsuitability of many indigenous species for large-scale farming, the problems of maintaining ecological balance and biodiversity, and ethical and conservation issues associated with exploiting indigenous fauna such as kangaroos. Vic Cherikoff said that he addresses such issues by foraging for much of the businesses' supplies and contracting people to produce goods indigenous to their land or lifestyle – often in cooperation with aboriginal communities. He said that this helps ensure that both environmental and social balance is maintained.

For details on Bush Tucker Supply call (02) 817 1060 or (03) 827 9201. ★

Snapshot

The New Corporate Model

The virtual corporation is a temporary network of independent companies – suppliers, customers, even erstwhile rivals – linked by information technology to share skills, costs, and access to one another's markets. It will have neither central office nor organisation chart. It will have no hierarchy and no vertical integration.

Source: *Business Week.* Feb 8 1993

As the rural sector struggles with devastating crises, information technology (IT) is emerging as a new focus promising to increase competitiveness, open up new business opportunities and help offset the isolation of rural communities.

Part of this trend is the Telecentre program, a multi-million-dollar initiative by the Department of Primary Industry and Energy (DPIE), and Telecom, bringing IT facilities to the bush.

Based on a successful Scandinavian model, the program involves creating multi-purpose, community based IT centres, called 'telecottages' or 'telecentres' in rural centres. Technology, training and general support are provided, enabling rural people, especially youth, to get onto computers and explore the diversity of services and opportunities available.

The range and configuration of equipment provided varies according to community needs, capabilities and resources but typically may include: multimedia terminals with modems; printers; photocopiers; scanners; a fax machine; audio and/or video conferencing equipment; and television with VCR. Users are able to explore teleworking, telelearning, training in computer hardware/software, and the new world of multi media, and offer services to the local/regional community (e.g. word processing, optical scanning, E-mail etc).

Australia's first three telecottages were initiated by Telecom and opened in 1992 in the towns of Walcha and Byron bay, NSW, and Cygnet, Tasmania. Strong financial support was provided by DPIE through its Rural Access Program (RAP) grants. DPIE

Bernard Lloyd

Telecottages – the vision and the record

According to Lars Qvortrup, the Dane who coined the term 'telecottage', these high-tech information clearing houses could save the rural way of life. They are capable of becoming a hybrid village hall, library, school and country store and a venue for renewed community activity and recreation. They could shape new institutional frameworks, linking the tiers of government community services, creating networks of decentralised production systems, 'virtual' offices of networked workers, and 'virtual' interactive class rooms. A utopian vision for telecottages sees them creating 'virtual' cities in the bush, providing the benefits of a large population base while retaining the rural atmosphere and other lifestyle benefits.

The growth of telecottages internationally is impressive, although there have been some problems. The idea of bringing IT into isolated rural settings was trialled in Sweden in 1985 and the Nordic countries now have over one hundred telecottages, or CTSC's (Community Teleservice Centres). Telecottages also operate in Britain, Germany, Canada and Brazil. There is an international association based in Nice, France, CTSC International. Australia will host the fourth CTSC international conference, "Telecottage '93", in November 1993.

Many telecottages are privately owned but the transition from public support to self-support has been more difficult than expected. A number of unspecific businesses providing distance work have failed and in Denmark two centres have closed. Telecottages have not competed successfully with similar services offered by urban-based enterprises, nor can they deliver unskilled work to a distant market. Specialisation, based in local competence is essential. Networking amongst telecottages is also vital to their success.

Sweden's telecottages work as one national enterprise, sharing software but also specialising in business areas like computer aided design, telemarketing or conference services.

Telecottages present us with a *technaeresis* –a set of choices emanating from the divergence of technological applications: information technology is built for a purpose but it inevitably allows further choices far beyond the purposes for which it was engineered. Are telecottages to be used simply to help make-up for the long-standing economic disadvantages of rural life or are they capable of much more?

For information about registering for the Telecottage '93 International Symposium call + 61 7 07 878-3358. It will be held at the Pan Pacific Hotel, Gold Coast, Queensland, 29 November to 1 December, 1993.

has since allocated $2.8 million over four years for the program.

Mr Ian Crellin, DPIE Telecentre Program Manager, says that 14 new telecottages/telecentres have been funded in remote towns such as Blackall, Queensland, Wudinna, South Australia, and Southern Cross, Western Australia, and 30 more are currently under review.

Mr Tom Cass, Telecom's Manager of Rural and Remote Services, says rural Australia must take advantage of the new technology, which can help both in developing new niche markets for rural products, and in enabling rural Australia to participate in entirely new jobs in the emerging information industry.

Mr Cass says Australia is set to move to the forefront of telecottage development worldwide in terms of the functions integrated into single cottages. "Ideally, students, teleworkers, small business, farmers and the unemployed can all make constructive use of the facilities. The range of potential uses and on-line services is extraordinary."

Mr Chris Weber, a New England grazier and chairperson of the Australia's first telecottage at Walcha, says the program is of real practical benefit to local people. "We're targeting farmers and graziers and providing training on wordprocessing, spreadsheets, databases and specialised accounting programs – if they don't want to buy their own equipment they come in here to work, get their books together and explore databases."

Mr Weber says that the Walcha telecottage has also successfully tendered for data entry and telesurvey work for local people, which is performed both at the centre and at individual homes.

"There was scepticism at first but we persevered. I think most of the community now see the value of computer skills and the power of the technology. They're getting a better sense of the centre's potential."

Mr Cass wants to see IT-based telelearning programs delivering state-of-the-art education and training across an Australia-wide open learning system, and he sees Australian telelearning as an potential export industry.

"IT allows more interactive and personal distance learning

Snapshot

Rural poverty

- Australian farmers' incomes fell to the lowest level recorded in 1991-92.
- The number of rural properties up for sale rose by over one-third last year, while prices tumbled.
- Between 50 and 70 per cent of our farmers are technically bankrupt.
- From 1980 to 1990 the nation's total rural debt increased from $3.7 billion to $11.7 billion.

Source: Common Wealth for the Common Good, quoting Ron Hicks and Morris West

than traditional paper-based approaches. Australia already has an international reputation for developing cost-effective distance learning solutions – for example, the School of the Air. We are well placed to develop world-class IT-based learning networks"

While rural areas could import education/training from metropolitan centres, he says there is no reason why the direction should not be reversed with knowledge, skills and even IT services being exported from regional and rural centres to urban Australian and international users.

"The beauty of teleworking and telecommuting is that your physical location ceases to be an issue, and you can put together a nation-wide workgroup in an instant. It makes good sense for remote IT services to be developed and maintained by people who are themselves geographically isolated – by those who depend on the technology."

Snapshot

Aborigines and jobs

- 40 per cent of employed Aboriginal men are in unskilled jobs.
- Only 43 per cent of Aborigines' income is from employment.
- The average income of those who work is 35 per cent of the national average.
- General unemployment among Aborigines is four times that of other Australians.

Source: *Common Wealth for the Common Good*, quoting Professor Robert Gregory, Professor Frank Jones and Minister for Aboriginal Affairs, Robert Tickner

The DPIE/Telecom focus is on community development with technology presented as a means to an end. Mr Crellin says that they are aiming to empower communities and help create "capable institutions – groups of people working towards a common objective".

The Telecentre program relies on strong community participation in development, implementation and management with the starting point being a Future Search Workshop involving a range of key stakeholders in the community. Mr Cass says that ultimately the success of individual cottages depends on the quality and depth of community support.

"We insist on the community making a substantial upfront contribution – at least providing a building, labor and a thorough business plan. We have to be sure that the community is clear about why they need the centre and how they are going to use it."

He says that if the Scandinavian experience is any indication, some telecottages will fail, but most will become institutions of central importance.

The telecottage/IT formula and the associated concepts of telelearning, teleworking and telemedicine create an array of new possibilities for rural Australia. In an environment of tight budgets and scarce resources, telecottages allow sharing of expensive facilities and services across a wide range of community groups for a wide range of functions.

Communities interested in starting their own telecottage can contact Mr Crellin on the Countrylink Answer Line, 008 026222. ★

Briefs

International award for ERIN

Australia's Environmental Resources Information Network (ERIN) has been awarded a Computerworld-Smithsonian award for the development of the Environmental Resources Information System (ERIS). ERIS is a network of environmental information systems providing users with access to geographically-related information through an easy to use interface. Innovators are recognised in ten defined categories. ERIN was nominated by SUN Microsystems, Inc in the category 'Environment, Energy and Agriculture'. ERIS was also awarded a Gold Australian Government Industry Productivity Award last February.

Rotating House

Sick of looking at the neighbors fence? Then the rotating house is for you.

German architect Theddo Terhorst has invented a house which rotates slightly every five minutes. Although it was primarily designed to maximise solar energy, the house would be a handy way of escaping obnoxious neighbors or maximising the views.

The pyramid shaped house weighs 180 tonnes and is rotated by six solar powered motors.

CSIRO water monitoring device

A new water quality monitoring device developed by the CSIRO uses mobile phone or satellite links to alert authorities to changes in water quality.

The submersible monitor, known as Qualtel, simultaneously measures a variety of water quality indicators and sends the results direct to researchers via mobile phone or satellite links.

It will enable researchers and water authorities to pinpoint where and when water quality changes take place. The system can also be used to monitor remote areas for break-outs of blue-green algae or pollution spills.

Once installed, it measures water quality indicators such as nitrates, phosphorus, ammonia, sulphides, pH, chloride, dissolved oxygen and temperature.

Science Minister Mr Ross Free said global markets for environmental monitoring instruments such as Qualtel could reach $23 billion by the end of the century.

Computer age carpentry

Carpenters and builders may work in an age-old trade, but their tools are rapidly changing in line with the computer age.

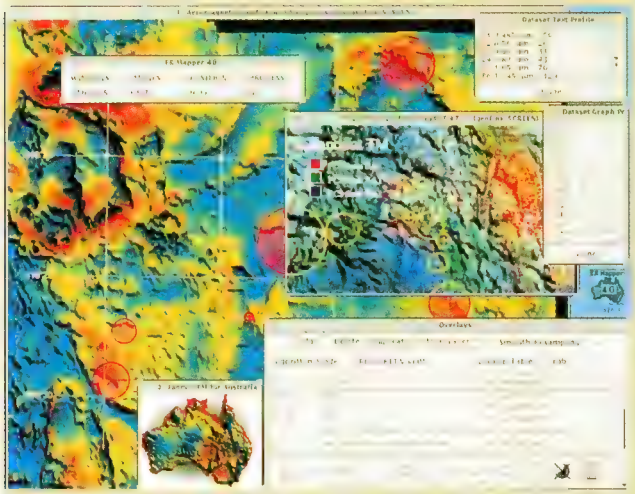
New electronic levels, digital callipers and displays on machines and a laser mitre saw are among some of the technological innovations sweeping the building industry.

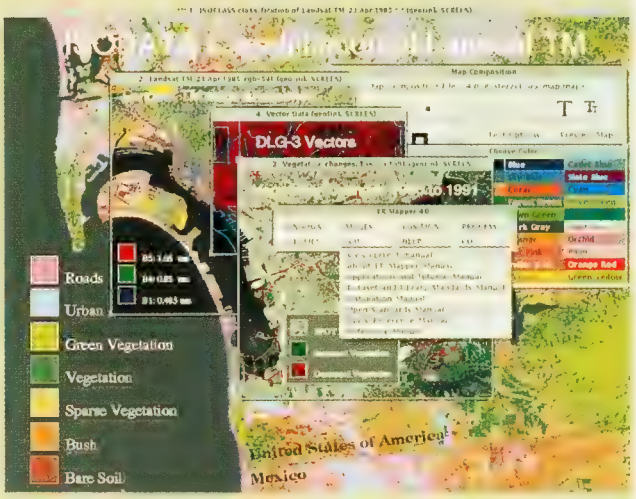
Electronic levels offer precise percentages, degrees and pitch. The laser mitre saw features a red laser beam which indicates exactly where the blade will cut.

While a high-tech replacement for the hammer has not yet been invented, sales of electric stud finders have skyrocketed. More than nine million electric stud finders were sold in the US last year.

David Eyre

CSIRO link with Earth Resource Mapping





Images produced by ER Mapper 4.0, an Australian software package for processing, enhancing and interpreting raw satellite data. The program is being used extensively by the oil and mining industries, and for such diverse applications as bush fire tracking, locating marihuana crops and analysing density of stands in forestry.

Earth Resource Mapping (ERM) and CSIROs Division of Maths and Statistics (DMS) are working together to research, develop and transfer DMS research into future releases of the ERM mapping software. The technology to be transferred includes triangulated warping, advanced classification techniques and comprehensive statistical visualisation.

An Australian company, ERM is a leading international producer of software for processing, enhancing and interpreting raw satellite data. The ERM software, ER Mapper 4.0, has wide applications in mining and natural resource management. Marketing manager, Mrs Sharon Lezer, said that ERM is being used by the oil and mining industries for land information in agriculture (e.g. for correlating crop yields with soil type), and for such diverse applications as bush fire tracking, locating marihuana crops and analysing density of stands in forestry.

ER Mapper 4.0 offers:

• Land Information features, including classification methods (such as ISODATA), multivariate analysis, raster to vector polygon conversion, raster GIS classification analysis, and statistics generation, editing, and display.

• A GUI-based map composition feature that allows the layout and composition of maps, including objects such as titles, legends, grids, scale bars, clip masks, logos, and also user-defined objects.

• 'Virtual datasets', a revolutionary new concept that allows defining a view into data that can be treated as a real dataset. Virtual datasets provide many benefits, including large disk storage savings, complex multi-stage processing, and new virtual data types (such as a virtual 7-band 10-meter dataset combining Landsat TM and SPOT Panchromatic).

• Geolinking and geopositioning features, including the ability to geolink multiple image windows to a common extent or map sheet, and a new geoposition window that simplifies control of image extents and zoom factors.

• Import programs (including GeoQuest ASCII grids, Geosoft grid formats, and PICS format), and export programs (including ARC/ INFO Raster Grids and XYZ format ASCII grids), for a total of over 80 import/ export formats in all.

ER Mapper 4.0 is available on a variety of workstations, including Sun (SunOS and Solaris 2.1), DEC Ultrix/ MIPS, DEC OSF/Alpha, Silicon Graphics, and Hewlett-Packard, and is shipped on CD-ROM with over 400 Mb of sample data.

Fully functional four-week evaluations of ER Mapper are available for $200, including complete hardcopy manuals. ERM also offers a free ER Mapper 4.0 evaluation CD-ROM that includes full on-line manuals and limited functionality, lasting 30 minutes.

Additional information on ER Mapper is available from ERM's Australian office: Level 1, 87 Colin Street, West Perth, Western Australia 6005, +61 9 388-2900, fax +61 9 388-2901. ★

Snapshot

Economic growth in China

An OECD report on the so-called Chinese economic area, comprising China, Taiwan, Hong Kong, suggests that by 2030 this region might account for 12% of world GDP and 20% of world trade. The report assumes that China's real GDP will grow by 7% p.a. over 1990-2030. Projections by DRI are on broadly similar lines, seeing China's real GDP growing by almost 8% p.a. over 1993-2000, with industrial production doubling over the same period.

Source: *OECD Future Studies Information Base Highlights*, Number 5, June 1993

Powerhouse technologies

Jane Townsend of Sydney's Powerhouse Museum with a fibre optic chandelier – one of the displays in a new exhibition exploring the future of domestic telecommunications technology.

Visitors to Sydney's Powerhouse Museum will soon be trying technologies most Australians have only read about.

A new exhibition, *Telecom Laserlink: At Home in the Future*, will explore the future of domestic telecommunications – from videophones, smart phones and teleshopping, to high definition TV, cable TV and on-line databases.

Exhibition activities will include using a videophone, learning Japanese characters on touchscreen computers and playing an interactive TV quiz game based on hilarious past predictions about telecommunications.

Telecom began replacing its network of copper cables with fibreoptics a decade ago. Made of glass and narrower than a human hair, fibre optical cables have a vastly greater capacity to carry data than their predecessors.

Terence Measham, Director of the Powerhouse Museum says the Laserlink technology is the next stage of connecting homes to the Telecom network, soon to be followed by services allowing the merging of TV, telephone and computer functions in the home.

The exhibition opens 3 September 1993 and will run for twelve months. It is supported by Telecom Australia. The Powerhouse is open daily between 10am and 5pm at 500 Harris Street, Ultimo. For more information, phone (02) 217 0111. ★

Snapshot

Marketing

In the USA, Computer databases are increasingly used in promotion schemes, remembering purchases and linking products with the shoppers who bought them. A 1992 survey found that 14% of chains and 12% of independent grocers used some sort of computer database system to track consumer purchases.

Source: *Congressional Institute for Future.*
Spring 1993

Briefs

Hype over hypertension

Gobbling greasy burgers and French fries on the go is often cited as a cause of hypertension. But if a group of international scientists is right, hypertension may have as much to do with genes as diet.

French and American scientists have isolated a gene which for some people, increases their chance of acquiring a form of hypertension.

It is the first evidence to support a long held theory linking salt related hypertension to genetics.

Through a study of hypertensive siblings, the researchers found that the study group tended to have the same kind of gene variation that encodes a certain protein.

Animal patent battle resumes

The battle between supporters and opponents of animal patents has reopened following the US patent office's decision to grant patents on genetically altered animals.

The office reopened the issue in December 1992, when it issued three patents on transgenic mice. It was the first such patent in four years and is sure to re-ignite the divisive debate over genetically engineered animals.

In 1988, the patent office sparked international controversy when it granted a patent for the Harvard onco-mouse – a mouse genetically engineered to develop cancer.

Animal rights groups and the vocal Foundation on Economic Trends have threatened an extended legal battle against the latest decision. They argue the agency should study the impact of transgenic mice on health and the environment before issuing more patents.

Vaccination for tooth decay

Researchers in the United States have come one step closer to a vaccination against tooth decay.

Tests on rats suggest a vaccine against tooth decay may be possible in the future.

The discovery centres around a bacteria – *P. gingivalis* – which causes tooth decay.

The researchers injected a group of rats with a synthetic molecule taken from a small piece of protein found in the bacterium's fimbria. The rats were then injected with the tooth decay bacterium, but even after six weeks, showed little or no sign of tooth decay.

While promising, the results must still be tested on primates. Gap tooth smiles and visits to the dentist are with us for a while at least.

Recycled briefcases

Plastic recycling is entering the country's boardrooms via an innovative range of briefcases, folders and clipboards made from recycled plastic.

The Melbourne firm, Megara (Australia) recently released a range of office products made from recycled polypropylene. The company also hopes to close the waste loop by taking back its own products for recycling.

Sandra Webster

Modern cycling

Traffic jams are a motorist's worst nightmare: row upon row of cars inching forward in sweltering heat, idly pumping fumes and exhaust into a sulphur tinged sky. Twice a day – sometimes more depending on where you live – motorists' cars choke city streets in the rush to and from work.

Over 80 per cent of commuters travel by car even though the average peak hour speed of 20km/h, or even less in the inner city, can be easily matched by a cyclist. And given growing concern about pollution and the health effects of car emissions, why is it as few as 2.5 per cent of commuters choose to make their journey by bicycle?

It seems using bicycles is not as deeply ingrained in the urban Australian psyche as it is in some European or South East Asian cities. Yet in Melbourne households alone, there are more than 1.5 million bicycles.

The high incidence of bicycle use in European cities such as Delft and Basel reflects not only an established tradition of bicycle use and a higher population density, but the success of local programs encouraging cyclists through improved road works.

In the Netherlands over 50 per cent of commuters make bicycle trips. "There's nothing magical about why the Netherlands has such high figures," says Harry Barber from Bicycle Victoria. "There aren't pot-holes and obstructions and laws forbidding you to travel on certain roads and bridges and there are no difficult intersections to cross."

Urban designers, Mr Barber suggests, need to rethink their approach to planning the newer outer suburban regions. Growth corridors outside Melbourne like Keilor and Berwick are designed around the car. The needs of pedestrians and cyclists are often overlooked.

Bicycle design is becoming increasingly sophisticated, attracting more people away from their cars. Recent innovations in the design of race quality bikes include the use of the metal titanium, more generally found in the aerospace and aircraft hydraulic industries, because of its extreme durability, lightness and ability to absorb shock.

One American bicycle manufacturer now uses more titanium annually than the giant aircraft company McDonnell Douglas.

The most exotic design comes from the Lotus car company which is more traditionally associated with the auto racing industry. The company has applied its knowledge of aerodynamics and composite materials to produce the 'Formula One' of bicycles – the Lotus Sport Pro 2B.

The bicycle, on which British rider Chris Boardman won gold at the Barcelona Olympics, features a revolutionary design developed by a team of aerodynamicists and engineers. Lotus describes it as "an aerofloat on wheels".

The rear wheel is offset 16mm to the left of the front wheel while the monoblade front fork and handlebars are one unit. The rider assumes a position described as an 'ultra-aero crouch' with the forearms flattened against the upper handlebars. While this does not offer a comfortable ride to the average cyclist and the starting price of $35,000 is a little steep, the design lessons in airflow management and minimisation will find their way into all bicycle design.

A more practical choice for the inner city commuter is an electric bicycle designed by Victorian, Ray Russell. The bike's motor runs on a car battery which recharges from a power point over night and will travel for 50km over any surface. The bike has no pedals and is environmentally friendly. The rider requires no licence, registration or insurance since it is legally defined as a bicycle.

Cyclists can also tap into the cycle computer which fits on the handlebars and gives a continuous heart rate display through a wireless pulse transmission. This not only tells the rider the number of kilometres covered and the amount of energy expended but will even establish something manufacturers describe as the 'optimum aerobic training zone'.

In Chinese cities 77 per cent of trips are made by bicycle, a figure unlikely to be matched in Australian cities in the near future given our different cultural perceptions. Yet there has been a substantial growth in the number of commuters using bicycles in Manhattan over the past decade even though the city's roads are chaotic and in bad repair.

Riders are more aware of the escalating dangers of car emissions and appear willing to avoid contributing to the problem. They are also aware that a cyclist in the inner city is likely to arrive earlier to a destination than a car driver. And as one regular rider says, "I get fit for free". ★

Snapshot

The global teenager

Barring widespread plague or other catastrophe, there will be over two billion teenagers in the world in the year 2001. That's 50 times the number of teenagers in America in the peak years of the baby boom. Most of them live in Asia and Latin America; a smaller but still sizeable and rapidly growing percentage live in Africa. In Europe, North America, and Australia, meanwhile, there will also be a mini-baby boom, but their percentage of the global teenager population will be minuscule.

Source: *The Art of the Long View*, Peter Schwartz

Snapshot

Thick Information

There are two types of information, "thick" information and "thin", and what you get with a computer is the second variety. Thick information is irrational, subjective, intuitive knowledge, rich in detail and color, far beyond what can be quantified and aggregated. That sort of information must be dug out "in situ", by people intimately involved with the events.

Source: *Mintzberg on Management*, Henry Mintzberg, 1989

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The future of cars

Redesigning today's car is no substitute for redesigning the transport system. It merely buys time, says Amory Lovins, a director of research at the Rocky Mountain Institute, an independent non-profit resource organisation in Old Snowmass in Colorado. He talked recently to Robyn Williams about the future of cars.

Robyn Williams: Would you describe these future cars for us?
Amory Lovins: Supercars are family size cars that are ultra-light. They weigh two to four times less, they're several times as streamlined, they run the wheels electrically but instead of hauling about half a tonne of heavy batteries that you plug into recharge, you make the electricity on board as needed, in a small engine or fuel cell. They can burn any fuel and are five to ten times as efficient as present cars. But they're also superior in other respects; they're more comfortable, beautiful, durable, quiet, a lot safer and peppier.

RW: Your talking about them as if they're in the present tense. Has somebody already made them?
AL: Somebody has made the various bits. General Motors for example two years ago developed a prototype car in a hundred days that was twice as efficient as present cars, weighed less than half as much, was three times as slippery, would carry four adults entirely across Australia on little over 100 litres, and cruise at one hundred kilometres per hour on about three kilowatts or four horsepower. Which is about four or five times less than an ordinary car takes to cruise, and yet it accelerates as well as a very respectable sports car and will do twice the legal limit. You can go directly to jail anywhere, and it's quite beautiful. Most people who see it want one.

RW: So if they've already started designing them, and preparing the bits, when do you think the car, a car, will be ready to drive?
AL: That depends on two things, neither of which is public desire. I think if people can get a car with the properties I have described, they'd want to, especially because it may well be cheaper than present cars. I think there are two obstacles. One is that the car industry is basically a dye making and steel stamping culture which finds it hard to get used to moulded materials like carbon fibre composites. It is used to direct mechanical drive from internal combustion engines so it is hard to get used to special English motors and fancy electronics and software. This is really much more like a computer with wheels than it is a car with chips.

So there is a major cultural change, and this may result in the supercar being initiated not so much by the auto industry, or even the aerospace industry, as by system integrators, the sort of Hewlett Packards of the world, or by garage start ups – you know, the next Apple, the next Xerox, the next Dell, but in the car business.

The second obstacle is that we need to make the transition smoother by conditioning the market for supercars, because right now only a small fraction of your cost of driving is petrol. Therefore, for example in Japan, petrol is priced three times higher than in the US, and yet the Japanese new cars are slightly less efficient than the American new cars. This is a very weak signal to buy an efficient car. But what we could do and indeed Australia could do this very well, is called a 'feebate'. When you buy a new car you pay a fee or get a rebate. Which or how big depends on how efficient your new car is. The fees pay for the rebate, so it is not a new tax, and we can base the rebate for the efficient new car on the difference in efficiency between the new car you buy and the old car you scrap. So we get the dirty inefficient cars off the road much faster. And actually the auto-industry should like that, because they will sell more cars.

RW: What about the roads, you haven't mentioned them yet?
AW: We wouldn't need to change the roads. These cars would handle extremely well. They would have super anti-lock braking, anti-skid traction on all four wheels, much better than today's. But of course the qualities that I describe will make cars even more attractive than now. And if we had these 60 or a 120 kilometre per litre, renewably-filled, safe, attractive family cars, which we can do, then one million Bostonians, one million Los Angelanos, a billion Chinese, driving them wouldn't work. We wouldn't run out of oil or air any more, but we would certainly run out of roads and patience.

So although supercars are very important for reducing some of the environmental, economic and security costs of the present car, and they can give whoever does it first a durably competitive car industry, they are no substitute for redesigning the transport system from scratch. All it does is buy

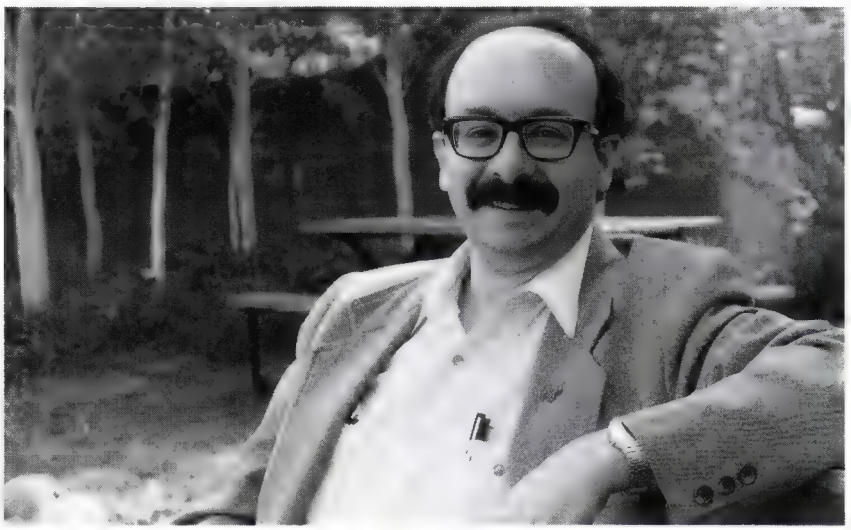


PHOTO: ROCKY MOUNTAIN INSTITUTE

Amory Lovins: "It is much more like a computer with wheels than a car with chips"

time to do that, which will take some decades. Because we really need to let all ways of getting access to where we want to be compete with each other. And the best way to get access is to be there already, so you needn't go somewhere else.

RW: I'll move us forward very quickly to 2013. What do you think in the best of all possible worlds such a redesigned transport system might look like?

AL: We would have many of the reforms Peter Newman's group in Perth are calling for; sensible land use, traffic calming, much better public transport, and indeed the rest of the world has a lot to learn from some Australian practice, and we all have a lot to learn from even more innovative countries that have fewer resources. For example I have just been with Jamie Learner, the Mayor of Curitiba, in Parana, Brazil, who has done extraordinary things with almost no budget.

His city has I believe the highest car ownership and the lowest car drivership in Brazil. It is simply cheaper and more convenient for people to take the bus, because the bus goes by at one minute intervals and it costs about ten cents a ride, unsubsidised.

How does he do this? Well, very simple innovations. For example, before you get on the bus you go into a big plastic pod that is standing on the side of the road, you pay your fare through a turnstile when you go in, the pod fills up with people who pay their fare, the bus pulls up along side, doors whoosh open, the floor is at the same level, you go onto the bus and off you go. You get off the same way. And this happens at one minute intervals during the peak hours. Well none of us in the North, or in the advanced South like Australia, have systems that work that well, but we could do. The innovation has been done and we can imitate it.

I think also, we are likely to have a kind of economic glasnost, prices that tell the truth. I mean if we don't know how much something really costs, we don't know how much is enough. And in my own country at least we have estimates of about three quarters of a trillion dollars per year social cost of highway travel. That is probably five or ten times what we think we are paying for it at the petrol pump. And yet those are larcenous costs imposed on people at other times and other places. They are a real cost to society, they ought to be internalised in what we pay. And we also need in a sense nega-kilometre markets, so that all ways to get where we want to be or not need to go can compete properly.

A simple example, in 2013, and I hope a lot sooner than that, you won't have a free parking place at your place of work, nor will you have a company

AMORY LOVINS is the Andrew Denton of energy conservation. He seems quite small, is very funny and at the same time, fiercely intelligent.

I'd not met him before. We bumped into each other at a party held in the Sheraton Hotel in Boston (Mass), the venue for the annual meeting of the American Association for the Advancement of Science. Lovins was chatting to Henry Kendall, 1990 winner of the Nobel Prize for physics and President of the Union of Concerned Scientists.

Lovins, who is more robust close up (as is Denton), reminded me of one of those impresarios at a Victorian Music Hall, maybe a circus ringmaster, all twirly moustache and jocularity.

I said "D'you have time for a quick interview. I'll ask you all the usual questions."

"Yes, of course," he twinkled, moustache twitching like a lively ferret under his nose, "and I shall give you all the usual answers."

Well, he didn't. Amory Lovins is always original. He's the energy expert the complacent really love to hate – because he is so often right.

Amory Lovins is director of the Rocky Mountains Institute in Colorado. He once lived in England and, indeed, was at Oxford for a while. Now he is one of those conservationists essential for the '90's and beyond: someone who is utterly green but can work with industry, someone who is unabashed by the seriousness of our global situation ecologically, but who is determined to have a giggle as he talks about it.

One more thing I found impressive, as we discussed the future of the motor car: he is fully in touch with some of the important work being done here in Australia. R.W.

car. If you have a car it's yours and you pay for it, and if you want to drive your car to work, you pay fair market value for the parking place. However, every worker also gets a commuting allowance, whose after tax value equals the cost of the parking space.

The result of that is that if you want to telecommute, or get to work by car pooling, ride sharing, bicycle walking, public transit, out of body trips, whatever, as long as it is cheaper than driving and parking your car, you can pocket the difference. So we have now fostered and modified competition between all modes of access to work, and as a result the demand for parking will decrease, and that will leave the employers with enough reduced demand that they will be able to pay the extra tax on the perk that they just gave you. Similarly we will have a lot more co-location of where we live, where we work, where we shop, such as we already get around transit corridors. Perhaps, as in America, we will have energy efficient mortgages – you can get a bigger mortgage on the same income if you have lower energy bills – and that may come to include commuting costs, which will of course make urban sprawl less affordable and urban density more affordable.

Developers will have more incentives to have jobs and housing close together and to build in or near transit corridors. They will have disincentives to do greenfields sprawl. We will probably pay at the pump for the collision insurance for our cars, which will look like a stiff petrol tax but actually won't be a petrol tax, and our insurance bills will go down, there will be no uninsured motorists. In other words we will have a much more economically rational system. And if we had that system today, and wanted to change to the one that we observe all round us now, one would say that was completely irrational. But by a series of historical accidents, here we are with a Stalinist centrally planned transport system built round the automobile, and the principle is you will have highways and other car infrastructure and parking, paid for as a socialised cost by taxes.

And if you want to do something else you are free to, and you can pay for that too. Well, that doesn't make sense any more. The costs of automobility are just too high. And I don't mean just environmental and security and out of pocket costs, and people killed on the roads and so on, I mean the disenfranchisement of the old or young who can't drive, or the handicapped, who are in a sense imprisoned in a society in which they can't get the mobility everybody else thinks they need. I am talking about giving over our public realm to the automobile and reducing our social interactions to aggressive competition for squares of asphalt. That is not what life is about, and I think if we start charging what it really costs for automobility, we will have a lot less of it, we will have much more pleasant and convivial cities, and life generally will be better. We will wonder why we didn't do it all along.

"...if we had these 60 or 120 kilometre per litre, renewably-filled, safe, attractive family cars, which we can do, then one million Bostonians, one million Los Angelanos, a billion Chinese, driving them wouldn't work...we would certainly run out of roads and patience."

RW: Yes, I wonder what Los Angeles, which is an extreme example, might look like. I seem to remember a figure, maybe it came from you, that seventy percent of the surface area of Los Angeles is given over to the motor car. Highways, parking lots, parking buildings and who knows what else.

AL: That's probably not a bad estimate. The numbers of that source are quite extraordinary. Now what Australia has managed in some of its cities is to make a lot less of those mistakes than we did in Los Angeles, and you have some very good developments in say traffic calming and transit. But I think we still need a lot more in both our countries before we have got to the mix of access modes that really make sense. And did you notice I said access, not mobility. Mobility is one way to get access, another way again is to be there already. It has taken us decades to build up not very sensible land use patterns that have us running about all the time when we don't really need to. My own commute to work is ten metres across the jungle in our house. It is suggested we install vines and swing to work. And it is certainly very pleasant not to have to get into my car. I do have a car, it is a very efficient car, but I only filled it up I think four times last year, as I really don't need to drive it much.

RW: Of four times, how many gallons would you say, or litres, that might have been.

AL: It takes about forty litres to a filling. I live in a rural area by the way, but my car is quite efficient, it actually runs about 25 km per litre, and of course that barely scratches the surface of what sort of car I would like to have and I think I will have in due course.

RW: And all this will do tremendous things to the atmosphere whether there's global warming or not.

AL: Oh yes. I mean, as with other methods of abating global warming, it is much cheaper today to save fuel than to burn fuel. Therefore the carbon you don't put into the air by substituting efficiency for fuel is avoided not at a cost but at a profit, and since it is profitable you can do it in the market. Whoever does supercars first is going to get very rich. ★

David Hassall

Cars of today: here to stay?

Cars are certainly the focus of a large human design effort, but evidence suggests we are still only tinkering at the edges of the problem. Despite environmental pressures, today's internal combustion, petrol-powered cars are likely to be with us well into the 21st century – if only because there is as yet no realistic alternative to either car travel or fossil fuel.

Computer aided design at the Ford Motor Company, Detroit

THE motor car. Depending on your standpoint, it is either the greatest invention on the planet or one of the great evils of modern society and a threat to the future of mankind.

Whatever the view, one thing about the car is irrefutable – it is here to stay. Personalised transport is as much a part of life as breathing and the car will be the choice of people around the world well into the 21st century, and probably beyond.

So what will the cars of the 21st century be like? What radical designs will we see? What wonderful new fuels will propel us into a new age?

Perhaps disappointingly for the futurists, the answers are not as extraordinary as one might imagine, despite the environmental pressures which are driving the world's car-makers.

For a start, the internal combustion engine is likely to remain as the dominant force throughout our lifetime and we will rely on petrol for the foreseeable future.

An oil-dependent future? That may surprise and disappoint a lot of people, but oil remains the most potent and

"Oil remains the most potent and efficient energy source available. With modern engine management techniques, advances in petrol mixes and improvements in vehicle design, the petrol-powered engine still presents a tough target for any of the alternatives."

PHOTO: JOHN MELLOR PTY LTD

Ford electric vehicle Connecta

efficient energy source available. With modern engine management techniques, advances in petrol mixes and improvements in vehicle design, the petrol-powered engine still presents a tough target for any of the alternatives.

Fears of running out of oil have subsided since the fuel crisis 20 years ago and there now appear to be enough known reserves to keep us going until the middle of next century. Beyond that, there is plenty more oil, but it is harder to get and we will therefore have to pay more for it.

The biggest threat to oil and the health of the planet is the rapid development of China and the Eastern Bloc nations. The car populations in mature nations are growing only moderately and, with cleaner, more efficient cars, emissions and fuel consumption is actually reducing each year.

In the developing nations, the environment is taking a back seat to economic development. Millions more cars will hit the world's roads, and the people buying them will know nothing of unleaded petrol, catalytic converters, electronic fuel injection systems, lightweight materials, recyclability or ozone-depleting gases, let alone alternative fuels – unless developed nations successfully apply environmental pressure on them to think globally.

The technology already exists to make the world's air cleaner, provided people can afford to buy modern cars and scrap their old polluters. The average age of Australian cars is about 10 years and a 10 year-old car produces about 15 times more pollution than a current model.

Saab 9000 Turbo models now sold in Australia have an engine management computer system which makes the engine run so efficiently that emissions are negligible. In fact, new systems such as these are so efficient that in heavily polluted cities such as London and Los Angeles, the air coming out of the exhaust pipe is actually cleaner than the ambient air entering the engine.

DESPITE such advances, and a belief within the car industry that petrol-engined cars remain the best option for the future, manufacturers are being forced to develop and build vehicles with alternative power sources.

The catalyst for change is the US state of California. The city of Los Angeles is one of the dirtiest in the world, for two reasons. Firstly, it has virtually no public transport and is therefore a car-dependent city. Secondly, it lies in a geographic basin, known by the Indians hundreds of years ago as the valley of smoke.

To deal with the problem, California has been introducing increasingly tough legislation dealing with cars, the most dramatic of which is the electric car mandate. This requires electric cars to account for two per cent of sales in California by 1998 and rising thereafter.

Electric cars are good for Los Angeles because they theoretically create no pollution. However, the electricity stations which provide their power create enormous pollution – even more than the equivalent number of cars, according to some sources – but they are located elsewhere. So electric cars do not solve the pollution problem so much as relocate and centralise it.

Despite producing apparently endless electric car prototypes, the car industry has technological and marketing problems associated with electric cars which have no apparent solutions. The size of the technical problem is such that, for the first time, the US Big Three automakers are working together to find the battery breakthrough so desperately needed.

The man in the gun-barrel at Ford Motor Co is the director of automotive emissions and fuel economy, Mr Don Buist, who seems unusually pleased to be retiring in a few years' time and handing the problem over to someone else.

Mr Buist said there was no breakthrough in sight – sodium sulphate batteries are the best prospect – so the electric cars that hit the market in 1998 seem destined to have a range of only a couple of hundred kilometres, will take all night to recharge and the batteries will have to replaced after four years at a cost of about US$8000.

This is clearly an unattractive scenario to the average Californian motorist, who does not even believe there is a pollution problem, who is reluctant to change from conventional

"The car populations in mature nations are growing only moderately and, with cleaner, more efficient cars, emissions and fuel consumption are actually reducing each year. In the developing nations, the environment is taking a back seat to economic development."

PHOTO: JOHN MELLOR PTY LTD

Car-mounted computer navigation system

cars, who can buy petrol for the equivalent of just 34 cents a litre and who is not prepared to pay one dollar more for any alternative-fuel vehicle.

Mr Buist says that Ford, like every other car company who wants to sell cars in the biggest US market, accepts that it will have to sell its 4000 or so electric cars at an enormous loss, probably to Government agencies forced to take them on. Very few private sales are expected.

The British design and development company Tickford regards electric vehicles as "technically very interesting, but impossibly impractical at present". The company tips that petrol and diesel-powered vehicles will reign supreme for at least the next 25 years. Beyond that, we might have electric cars in the garage, but only because inner-city areas will have banned non-electrics.

Methanol-powered cars are available in California, but Mr Buist said this fuel has a limited future. It is only marginally cleaner than petrol, is equally bad on greenhouse, does not work well in cold weather and, perhaps most worryingly, emits poisonous aldehyde gases.

Anyway, there is not enough farmland in the world to make sufficient methanol from crops and the alternative source, coal, raises even greater environmental concerns.

The future for methanol is likely to be as a mixture with diesel. Despite their apparent dirtiness, diesels are much better for the environment and Toyota in Japan has found that a diesel-methanol engine can be made to be soot-free, which would greatly reduce smog.

The dream fuel – perhaps the impossible dream – is hydrogen because it is virtually emission-free, water being its only by-product. Technically, though, hydrogen is a nightmare. There are no prospective answers to the dangers and difficulties of production, refuelling and storage in the vehicle.

Mr Buist believes that hydrogen is "still on the agenda" but is so far into the future that it is difficult to consider seriously. Toyota claims hydrogen is out of the question at least until the handling problems are solved.

The United States government under the Clinton administration has identified natural gas as the most viable alternative fuel in the foreseeable future and is prepared to order cars for Government fleets.

The biggest attraction is that the US has enormous natural gas deposits and can therefore become less dependent on the Middle East for fuel. Australia also has plentiful natural gas reserves and could easily be self-sufficient if necessary, as well as a major exporter to countries like Japan.

There are environmental benefits, too, because gas produces less air pollution, but this is tempered by the fact that its main constituent, methane, is an even more active greenhouse gas than carbon dioxide, the main emission from petrol.

Compressed natural gas (CNG) is already being used for heavy transport vehicles around the world and Victoria's Gas and Fuel Corporation is a leader in the field, but its practicality for domestic cars is compromised by its lack of density. CNG vehicles get less than half the range of a petrol vehicle with the same size tank. And, because the gas is stored under pressure, the tanks are very heavy and refuelling is potentially hazardous.

Liquified natural gas has a greater density, but is more expensive to produce and is even more volatile, making it less appropriate for widespread domestic use.

Liquid petroleum gas is used widely in Australia, but has not gained such favor overseas because it is an oil by-product, a fossil fuel that maintains dependence on the Middle East.

The overall style and design of vehicles in the future will be dictated by environmental considerations. Physically smaller engines will power vehicles which are lighter and more aerodynamic so that less fuel is used.

Steel will remain the dominant material in construction, but aluminium will be used more widely and steel-reinforced plastic may come into use. Modern composite materials such as carbon fibre and kevlar will play a role, but may be too expensive for the average car.

Manufacturers experimenting with plastic panels are finding they require huge gaps between the panels to allow for expansion, which makes them less attractive to buyers. Steel or

"Electric cars are good for Los Angeles because they theoretically create no pollution. However, the electricity stations which provide their power create enormous pollution...So electric cars do not solve the pollution problem so much as relocate and centralise it."

aluminium panels are favored for the future.

Many leading designers believe that the vehicles of the 21st century will feature the one-box design – egg-shaped like the Toyota Tarago people-mover, without the bonnet and boot of a contemporary three-box design. The trend should start with small cars and gradually move through the full size spectrum.

The more upright one-box designs will provide easier access for the increasingly elderly population of the 21st century and will feature more compact engines located in the nose and driving the front wheels, providing optimum interior space for the overall size.

Australia could play a vital role with the Orbital two-stroke engine. Not the original Orbital engine (which was shelved years ago), but a conventional two-stroke made environmentally acceptable by a revolutionary fuel injection system developed by Ralph Sarich's engineers in Perth.

Many of the world's biggest car-makers have license agreements with Orbital, and Ford plans to have an Orbital-engined production car on the market within three years. The engine promises to be powerful, economical and clean, while its compactness has designers hoping it proves viable for a mass market.

The chief designer at Ford in the US, Mr Jack Telnack, is a one-box crusader and he has support from Europe in the form of Renault design chief Mr Patrick Le Quement. Renault has recently shown prototypes in different sizes which have drawn praise from European show audiences.

Mr Telnack is naturally looking at bigger vehicles for the American market and has high hopes for the Orbital engine to dramatically reduce the engine compartment. Otherwise, he would like to see the development of the T-drive concept – six or eight cylinders in a row, mounted east-west in the vehicle with the transmission drive taken from the middle rather than the end of the engine.

Inside the car, electronically controlled luxury items such as cruise control, electric seats, power windows and automatic air conditioning will become standardised, but the electronics themselves will be more compact, cheaper and lighter thanks to multi-plexing.

Even the average car will be fitted with at least 32-byte microprocessors which will control and co-ordinate every part of the car's operation to ensure minimal fuel use and emissions.

Cars will glide along with computer-controlled suspension systems, anti-lock brakes and traction control will be standard, steering and throttle will be motor-driven and intelligent five-speed automatic transmissions will assess how you are driving and change gears accordingly.

Inside the car, there will be very little intrusive noise thanks to electronic noise-cancellation devices now being developed by Lotus Engineering in the UK. This will enable us to appreciate concert hall music quality from digital mini-discs and tiny acoustic speakers.

Vehicle electronics will be so sophisticated that if one device fails, another will take over its function. And if there is a problem with the car, a message will be sent by satellite to your dealer, an appointment made for a quick visit to the service centre, a replacement part ordered and a message sent to your personal computer – all before you realise anything is amiss.

Headlights will be tiny gas-discharge units producing such strong light that automatic level control will be necessary. Infra-red lighting will provide visibility of objects for hundreds of metres in poor weather conditions and at night.

Each driver will have a personal key or security card linked to sophisticated anti-theft devices, preventing the engine from starting or the transmission from being engaged. The personalised key will also move the driving position, mirrors and even the sound system to your own pre-set positions.

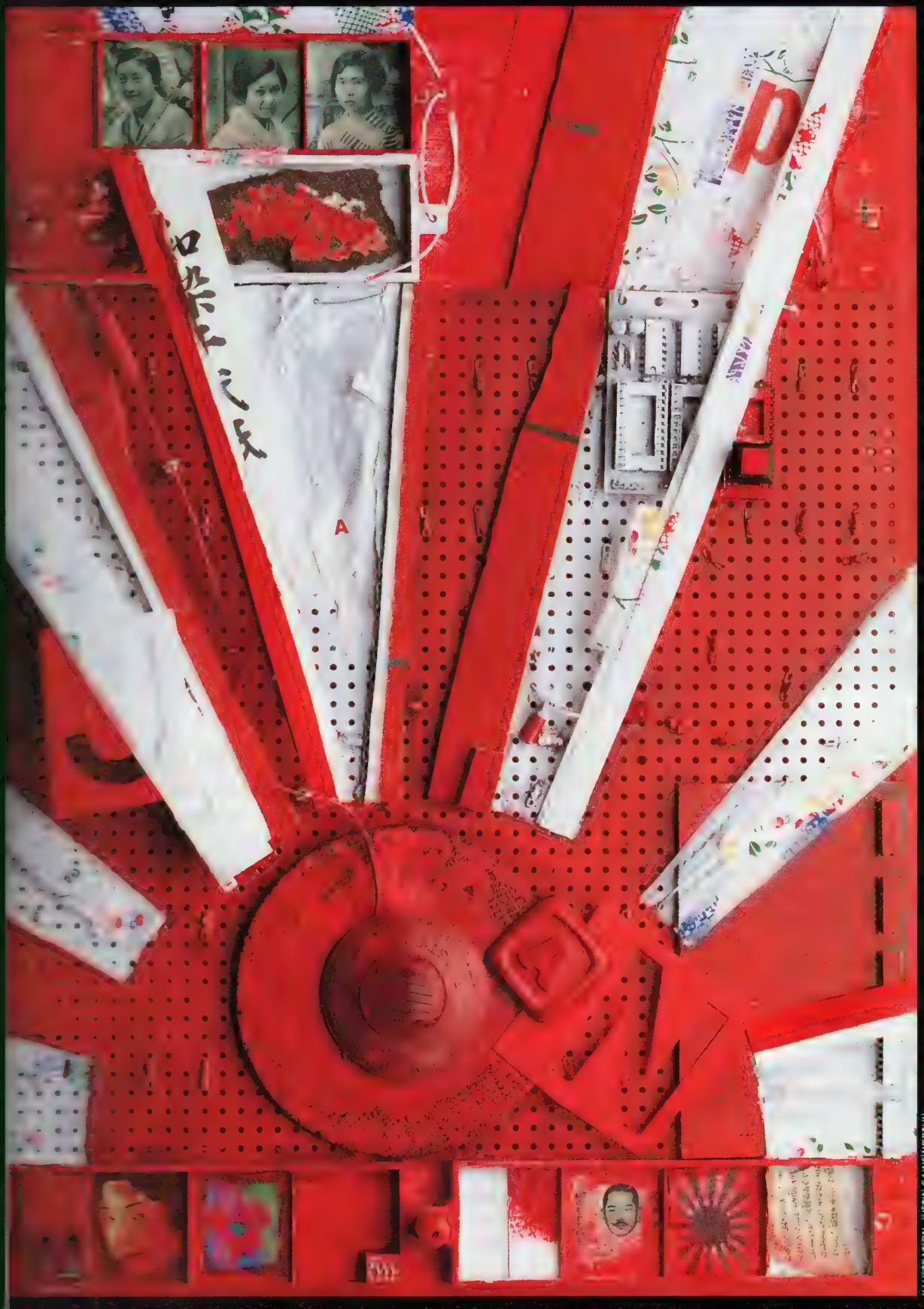
GETTING closer to a fantasy world, all this computer power and electronic control will be linked to satellite navigation and intelligent vehicle and highway control systems. Electronic sensors will monitor the distance between vehicles and signal a warning if you are too close for the speed. You will also receive warnings of accidents or other hazards ahead.

Road maps will not be necessary. Just tell the navigation computer where you want to go and it will provide a map or literally tell you, through voice synthesis, where to turn. Such systems are already in production and will be commonplace next century, when almost every road in the world will be digitally recorded and available via global positioning satellites.

Potentially, traffic monitoring could be used to slow your car if there is an accident ahead or even if your road behaviour is judged as being erratic or dangerous. Such control, however, will become the subject of social debate before it becomes accepted. But be warned: George Orwell was not wrong, just early.

An enticing view of the future or a frightening one? One thing is sure, though: the car of the 21st century will continue to be loved and loathed in equal proportion. And it will still be indispensable. ★

Behind the Japanese mask



29 pages featuring Tom Forester, Gavan McCormack, Alison Broinowski, Steve Utick, Greg Clark and Joanne Painter on Japan's other agendas.

ILLUSTRATION: JUSTIN GAINSWORTHY

Tom Forester

Silicon Samurai

Japan's IT takeover

Japan is about to take over the US in information technology. The story of how is the subject of a new book *Silicon Samurai: How Japan conquered the world's IT Industry* by Tom Forester. In this article, excerpted from the book, the author provides a snapshot of the Japanese strategies for IT dominance – and calculates what's at stake for the Western nations, including Australia, which have surrendered so much territory already.

WHEN AMERICA'S legendary Apple Corp recently launched a new range of notebook computers, reviewers marvelled at the ingenuity of these neat little machines.

It therefore came as something of a shock to learn that the basic Powerbook 100 model was entirely made, not in the USA by Apple, but in Japan by the Japanese consumer electronics giant Sony – a company not normally associated with computers.

What's more, when Apple announced its Newton pentop computer earlier this year, it turned out that the Newton was also to be made in Japan – by the consumer electronics firm Sharp.

Apple – the very symbol of American entrepreneurship – had apparently turned to Sony for assistance because it did not have enough engineers, the capital, or the expertise in miniaturized manufacturing, to swiftly put the Powerbook 100 into production.

Sony leapt at the chance to learn more about the personal computer business and gave the Powerbook project top priority, delivering the finished version from a half-page specification in less than 13 months. Powerbook also tied-in nicely with Sony's long term plan to branch out from consumer electronics into a broader range of information technology (IT) products.

There could hardly have been a better illustration of the current economic and technology trends in the IT industry – and the way they seem to be working in Japan's favor.

Japanese companies have unrivalled manufacturing facilities and the vast sums of capital needed to set up new high-tech production lines. More significantly, the case of the Powerbook 100 demonstrates all too clearly how the US computer industry has been "hollowed-out" by the Japanese, who now have command over the supply of key computer components like memory chips, LCD screens and floppy disk drives. As Japanese-American author Sheridan Tatsuno obligingly points out, in the Oriental game of Go, "...one doesn't attack one's rival head-on but conquers by surrounding him".

Japan is about to overtake America in IT, the key strategic technology of our era. Already, six out of the top ten microchip companies in the world are Japanese; five out of the top ten electronics companies are Japanese and the three fastest-growing computer companies in the world are Japanese.

The vast majority of VCRs, laptop computers, photocopiers and faxes we buy today have been manufactured in Japan. They join the transistor, the colour TV, the microwave oven, the microprocessor chip, optical fibre, video games, industrial robots and LCD screens on the long list of 20th century inventions which were born in the USA or Europe, but are now chiefly made in Japan.

Starting four decades ago with transistor radios and televisions, the Japanese had by the 1970s come to dominate audio, video and most other areas of consumer electronics. In the 1980s, Japanese companies targeted and swiftly captured leadership of the vitally-important semiconductor industry.

Since then, the Japanese have steadily moved up the so-called technology "food chain", quietly building market share in laptop computers, workstations, mainframe computers, supercomputers and software.

Along the way, they have gained a stranglehold over key areas of advanced manufacturing technology such as automated machine tools, robots and flexible manufacturing systems; they have come to reign supreme in major items of modern office equipment such as faxes and photocopiers; and they have become number one in the huge global telecoms equipment market.

In each sector, the Japanese have pursued the same basic game plan of importing and improving upon Western technology obtained through a variety of ways – some

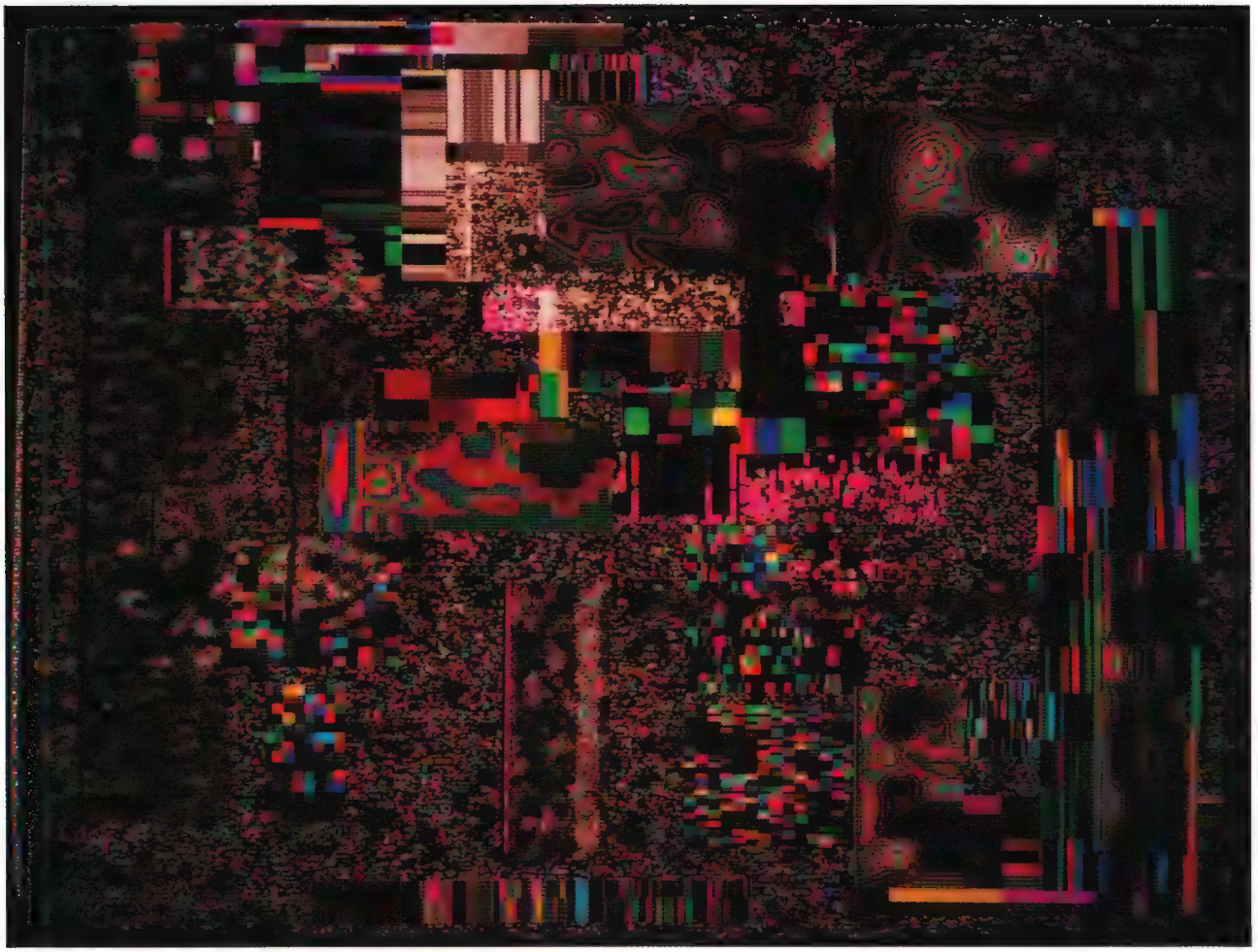


ILLUSTRATION STUART MCCORMICK

"Japan is about to overtake America in IT, the key strategic technology of our era. Already, six out of the top ten microchip companies in the world are Japanese; five out of the top ten electronics companies are Japanese and the three fastest-growing computer companies in the world are Japanese."

legitimate, some illegitimate; building up productive capacity and gaining production experience in a protected domestic market in which consumers pay inflated prices and from which foreigners are largely excluded; and launching coordinated attacks on overseas markets – especially the US – by slashing prices in order to 'buy' market share and by absorbing losses for as long as it takes to force foreign competitors out of business.

Finally, having relentlessly pursued market share at the expense of profits, Japanese companies have then raised prices in order to reap super-profits on key components – for which they are now monopoly suppliers. They also move upmarket to more profitable, sophisticated products. The profits are then re-invested – rather than distributed to stockholders – in order to maintain Japanese domination of a captured sector. This pattern of conquest has been played out time and time again.

Four times in the past 20 years, American and European commentators have proclaimed the Japanese miracle to be over. First there was the Oil Shock of 1973, which was supposed to put paid to Japan's industrial competitiveness. Then there was the 2nd Oil Shock of 1979 and the Yen Shock of 1986, which were also supposed to deliver death blows to Japan's economic aspirations. On each occasion, there was relief in the West that the game was finally up for the Japanese: now they were really finished! Yet each time the Japanese economy actually emerged from the crisis stronger, leaner, fitter and more internationally competitive than ever before.

Much the same thing happened in 1990-92, with the bursting of the so-called "bubble economy" in Japan. Once again, some Western observers of the "Japan is finished" school simply looked at the Nikkei index and declared that the end was nigh for Japan.

But the Japanese recession was always a pretty odd one by Western standards: not many recessions in the West are accompanied by 2 per cent unemployment, record balance of payments surpluses, higher savings rates and increased spending on R&D!

In their "readjustment," the Japanese authorities have taken the opportunity to cap inflation and to take some heat out of the stock market and property markets. Japanese manufacturers have taken the opportunity to upgrade their facilities, to trim product lines, to lengthen product cycles, to move upmarket and to move offshore – but there have been no massive, Western-style lay-offs. Not bad for a recession.

Yet profits for many Japanese corporations – especially in the IT sector – have fallen substantially and this has prompted some to rethink their traditional policy of relentlessly pursuing market share at the expense of profits.

Akio Morita, the high-profile chairman of Sony, is one of those urging Japanese companies to boost their razor-thin profit margins and to return higher dividends to shareholders – as happens in the West. In fact, Morita argues forcefully that Japanese companies should become more like Western companies by reducing working hours, granting longer holidays, treating employees more humanely, and paying more attention to environmental and community concerns.

Other observers have noted that "job hopping" from company to company is starting to become common in Japan, especially among younger workers. The tradition of lifetime employment is also being slowly eroded, as are other time-honored practices such as rigid seniority systems. And in one remarkable break with tradition, the giant Mitsubishi Corp last year appointed a British-born American resident, Minoru "Ben" Makihara, to be president and CEO. Until recently, Japanese executives who had spent even a few years overseas were usually said by their colleagues to "stink of butter."

But none of these modest changes to the way Japan's companies do business are likely to make much difference in the short-term. In the foreseeable future, nothing seems likely to derail the Japanese industrial juggernaut. As Richard I. Kirkland recently put it in *Fortune* magazine: "What can you say about an economy that was less than 10 per cent of the size of America's in 1960 and is now just over 60 per cent; whose trade surplus has doubled in seven years despite a 50 per cent increase in the value of its currency; that habitually spends 70 to 100 per cent more of its gross domestic product on capital investment than the US, and 33 per cent more on non-military R&D; whose household savings rate is more than three times higher than America's; and that, compared with the US, employs 70,000 more scientists and engineers on R&D in its labs and ten times the number of robots on its assembly lines?" What indeed.

In IT, the Japanese juggernaut is developing a stranglehold over key computer components such as flat-panel displays/LCD screens, memory chips and floppy disk drives. Next on the hit list are such items as microprocessor chips, high-definition TV (HDTV) screens, gallium arsenide chips, laser diodes and tiny nickel-hydride batteries.

PRESS reports last year indicated that American chip manufacturers, led by Intel, were fighting back strongly in EEPROM (electronically erasable programmable read-only memory) chips – better known as 'flash memory' chips and cards – but it later emerged that Intel had already licensed its EEPROM technology to Japan's Sharp and NMB Semiconductor.

Likewise, US manufacturers appeared to be well-placed in DSP (digital signal processing) chips, especially programmable DSPs, which have a wide range of applications (converting analog signals into digital and vice-versa) in consumer electronics and telecommunications.

But a temporary strength in one technology hardly guarantees a US comeback in consumer electronics, which is totally dominated by the Japanese, or a major US advance in telecoms, where the Japanese have shown themselves to be adept at working around such problems.

Indeed, the Japanese are in the process of introducing a whole new generation of high-tech whiz-bangs such as 'smart' cards (originally a French concept) for storing all kinds of transactional data, electronic dictionaries, personal organizers, shirtpocket computers, wristwatch pagers, 'intelligent' vacuum cleaners, 'smart' ovens, wall-hung TV screens, filmless cameras, tapeless answering machines and automatic translation telephones.

Most of these will be stylish, user-friendly, consumer appliances which will fit easily into the modern home or office. They will have in common multimedia capabilities and some form of 'intelligence,' such as fuzzy logic. In fact, just as we saw happen with cars, the Japanese are now setting standards for leading-edge design in IT products which the rest of the world is being forced to follow.

The Japanese have also targeted just about every conceivable future information technology for further investigation. Thus their projects to develop neural, optical

"But the Japanese recession was always a pretty odd one by Western standards: not many recessions in the West are accompanied by 2 per cent unemployment, record balance of payments surpluses, higher savings rates and increased spending on R&D!"

and molecular computers. The Japanese are also looking at micromachines or 'microbots' as part of an expected push into nanotechnology and they have massive R&D programs in biotechnology, new materials technology and aerospace, all of which have links with IT.

In his study of how the Japanese have made the transition from imitators to innovators, *Created in Japan* (Harper& Row, 1990), Sheridan Tatsuno declares: "By the mid 1990s, Japan's technological prowess could overwhelm the West, and the political shock waves of losing one next-generation industry after another to Japan will be severe. By the late 1990s, Japanese companies will have mastered the entire 'mandala of creativity.' They will excel not only at refining and recycling ideas but also at exploring and generating new ideas...By the year 2000 we may be left behind unless we wake up and reconsider our notions of creativity." The year 2000 is just six-and-a-half years away.

Will the Japanese share their new-found expertise with others? Will Japan continue to pursue unbridled nationalism, or is it about to embark on a new internationalist era of what some Japanese are calling "techno-globalism", in which a spirit of harmony and cooperation will reign in a so-called "borderless" world?

THE two key litmus tests of Japan's seriousness about techno-globalism are (1) whether Japan will truly open up its domestic market, not only to America and Europe, but to emerging Asian nations which Japan has said it wants to "help", and (2) whether Japan will share its technology secrets by changing its technology transfer policies in order to return the many favors it owes the West and to help Asia.

The problem with Japanese credibility on the technology transfer issue is that technology transfer to the Japanese has always been a one-way street. Ideas go back to Japan, but very few come out. As G. Dan Hutcheson, president of the US company VLSI Research, recently put it: "There's not a single instance in the past 20 years where a US company that licensed its technology to Japan was able to avoid losing that technology and the edge it provided over the next decade." While T.J. Rodgers, president of Cypress Semiconductor, when explaining why his company won't enter joint ventures with the Japanese, was quoted as saying: "We concluded that every company we negotiated with was after our technology, would blow us out of the (Japanese) market, and would come after our US market."

If it was serious about techno-globalism, the Japanese government would change its patent system to stop awarding patents to companies who are the first to file (rather than the first to invent) or who "flood" the patent office with similar patents on devices first seen overseas. It would open up Japanese research laboratories, especially corporate research laboratories, to foreign researchers. And it would consent to Korean, Taiwanese and Singaporean requests that it help out emerging Asian nations who have huge trade deficits with Japan by transferring more technology to them.

For years, Japan has done little to discourage the belief that it wanted to "help Asia", but the truth is that the Japanese see the Asian Tigers – especially the Koreans – as potential rivals who may one day out-Japan Japan. Asians find it just as hard as Westerners to penetrate the Japanese domestic market and they are even more dependent on Japan for high-tech components.

This raises the possibility that the Japanese could at some time in the future dramatically raise prices or even cut-off supplies. The Japanese have also switched production of things like TV sets to very low wage countries like Thailand and Malaysia in order to undermine the competitiveness of Korea, Taiwan, Singapore and Hong Kong.

In recent years, we have witnessed a literally massive transfer of wealth and economic power from America and Europe to Japan. This is because Japan has structured its industry, trade and technology policies, and tailored its domestic arrangements to ensure that it emerges as the dominant player in industry after industry it has targeted.

Much of that wealth has been transferred via the IT industry, which makes as large a hole in trade balances as the auto industry. In the 1990s, the size and importance of the IT industry is likely to grow and the dominance of Japan could be complete.

Unless drastic action is taken to ensure that America, Europe and indeed Australia do a better job of competing in the 1990s than they did in the 1970s and 1980s, then Americans, Europeans and Australians will continue to get poorer and the Japanese will get richer. Some people are not bothered about this, but it's worth knowing. ★

Alison Broinowski

Sex and sexism in Japanese culture

Much has been made of the uniqueness of Japanese sexual attitudes, and from a Western perspective, they seem to be both bizarre and incongruous – like elevator girls for whom furtive groping by customers is not so much an occupational hazard as an accepted part of the job. But these peculiarities are just an unfamiliar facade on a universal preoccupation, a maze of contradictions and paradoxes we will have to understand and accept if we are to forge closer trade and regional ties with Japan.

AN OBLIQUE line drawn from my upstairs bedroom window, when I was living in Tokyo in the mid 1980s, and the bathroom of the single storey house behind, would only have needed to be four metres long. Often I had gone to bed when the *salaryman*, my neighbour, arrived home around midnight, in a taxi, and began issuing orders:

'Beer! Dinner! Bath!'

Almost as if he was in my room, I could hear his wishes being fulfilled by his wife, the scurry of her slippers in the corridor, the bottle top coming off, the meal being served and half a dozen little dishes being cleared away, his tea being poured, his back being scrubbed.

On Friday nights he was usually home much later, and still she waited. On Saturdays he played golf somewhere too far away, and on Sundays, judging by the drawn shutters, he slept.

He was like her child. Their real children were grown up and lived in the suburbs. In the daytime, she shopped, lunched with women friends, some of whom she'd known since school days, took classes in ink-painting, tended dozens of African violets, or went to movies. She belonged to a club of women who invested in the stock market. Occasionally she shared her afternoon, as I could not but realise when I happened to come home from work to get something I had left upstairs, with a lover.

And not only with one. The cars in the street varied and so, now I was inclined to notice, so did the men. Adultery had a new meaning: in the day she was an adult. At night, she was a mother again.

She told me once, as we walked up the back street to the train, about 'a friend' who was dreading the imminent retirement of her husband, and was taking amphetamines. 'It will be like having a small child at home all day,' she speculated. 'Rather inconvenient.' Sensing she had disclosed more than she meant to, she asked about Australia. 'It must be different for you,' she said, 'because Western men are *feministo*.' 'Not all of them,' I said.

Feministo is the closest Japanese approximation to SNAG. It means a man who is inclined occasionally to pick up his own clothes and wash his own tea cups, and may address his wife in other terms than 'Hey you'. *Feministo* men in the Meiji period and in the 1920s cultivated the radical view that women were not weak in the head, and were worth educating. Before that, the Confucian orthodoxy as expounded in Kaibara Ekiken's *Onna Daigaku* was that a wife could be 'sent away' for any one of seven offences: disobedience, infertility, immorality, jealousy, dishonesty, disease, or outspokenness. Japanese women were not enfranchised until 1945, and to this day are in some administrative contexts still classed with 'minors'.

Near the station I often had to detour to get past a giggle of teenage girls outside what I thought of as the dolly shop. These resemble the lolly shops in Australian cities, except that instead of being stacked to the ceiling with nuts and liquorice allsorts in primary coloured boxes, they display a miasma of tiny gifts, fluffy animals, frilly and jingly ornaments, nonsensical English, pink, blue and lemon cuteness.

Valentine's day being imminent, the girls were hard at it, choosing trifles for their beaux. Had the reason for their shrieks and playful punches not been obvious, a stranger might have thought they were on a group outing from a mental institution. But this was serious business, like a bower bird's construction and decoration of its display site. The difference is that in the bower bird's case, it is the male that presents his Valentine trophies to the female, in the hope of her favours. The process culminates eventually in the colossal commercial extravaganza of the Japanese wedding.

JAPANESE retailers make any and every festival, traditional and foreign, their own, cranking up the public month after month with advertising aimed mainly, as it is in Australia, at women. Married women control domestic finances, and single

ILLUSTRATION: COURTESY OF MADE IN JAPAN, MELBOURNE, AND HONJO GALLERY, TOKYO

Kenrei Mon by Takeda Hideo

ones, earning good wages, are perceived to be spendthrifts. Gift promotions culminate, in December, with a feeding frenzy that, if Australian clergymen saw it, would give new meaning to their complaints about the Christ missing from Christmas. This in a society whose traditional aesthetic used to be about restraint and understatement, and whose oldest citizens remember such deprivation that roadside weeds were gathered for food.

A friend of mine keeps a notebook specially for entering the extraordinary statements he reads on bags and t-shirts in the train. Selected apparently at random from schoolbooks or dictionaries, some of them are so weird that he believes foreigners are hired to design them and are enjoying the joke. 'I fuck like a beast', announces the shirt of a clean-cut young man. In my host's bathroom on my most recent visit are 'Sopy' liquid soap and 'Rooty' conditioner. Down the street I pass a bar called 'Highly and Tightly'. Choice examples of this sort of thing have been collected over the years in Travellers' Tales in the *Far Eastern Economic Review*. Much less often, of course, do we see Australians taken to task for using Oriental squiggles to represent Japanese or Chinese characters, or for mistransliterating both languages.

ALL commentators on Japanese society look over the shoulders of train passengers of all ages and both sexes, and are tempted by what they are reading to believe they are the sex addicts that some of the T-shirts advertise. Sports newspapers may have baseball photos on the front, but by page three they get much more physical. In weekly magazines lightweight journalism is scantily draped around photos of even more scantily clad bodies and reports of gory crimes. Comics the size of telephone books contain some wonderful artwork and some extraordinary visual euphemisms – phallic eggplants, splayed irises, sinuous pythons, the kitsch and the kinky. Schoolgirls with moist eyes like dinner plates and hair like fairy floss seem constantly to have their skirts blow up or to walk over gratings. Women seem to weep, get chased, tied up, and stabbed a lot.

The eroto-graphic tradition goes back beyond Hokusai and the *ukiyo-e*, to representations of ancient amatory practices. But it has some talented modern exponents, including former cartoon artist Takeda Hideo, whose bizarre prints of tattooed warriors and billowing white-limbed women, often impaled on sharp instruments, suggest there really is something fundamentally different about the Japanese. Brett Whiteley told me about a nightclub he went to in Japan at which a select handful of men sat around a revolving stage, very closely inspecting a naked woman who assumed various positions

"Before we throw up our hands and label Japan a man's country, let's not forget that Australian women occupy a disproportionately small number of top positions in business, law, Government, universities, churches and parliaments...that free mammograms are still not available in Australia, in spite of breast cancer being one of the highest causes of death for women...and that domestic violence against women remains endemic."

at their request. The scene is probably replicated, with variations, all over Japan any night of the week and in many of the foreign destinations of Japanese sex tours.

But those who wag a finger at Japan conveniently disregard the fact that there women are safe in the streets. Japan seems not to be riding the escalator of sex and violence elsewhere that brings us Bosnia, South Africa, Madonna, and Bret Easton Ellis, and in Australia, Mr Cruel and the Strathfield, Hoddle Street and Queen Street mass murders. Strippers perform in hardware stores in Australian cities, and pubs advertise barmaids dressed as nurses, schoolgirls, French maids and so on. The body-count of girls, boys and women abducted, violated and killed resembles warfare. As in warfare, the overwhelming number of killers are men.

It is puzzling, therefore, to read recently of Australian journalist Peter Hartcher's shock that elevator girls in Japanese department stories get furtively groped, as do women on trains, and that chapters on sexuality and lesbianism are prudishly omitted from books on western feminism translated into Japanese. He writes that incest between mothers and sons is 'a major problem' in Japan. He contrasts the law-abiding national character with the rise of violence in schools. But he makes these sound like Japanese peculiarities, when many other countries, including Australia, have similar or worse problems.

One of the great delights of Japan remains the neighbourhood *sento*, the bathhouse, where soap, steam, shampoo and scenic murals sentimentally combine in a segregated, sexless way to recreate the lost village, where it was all for one and one for all in the big immerser. Out in the country it is still possible to indulge in unsegregated soaking, and in some hot spring resorts this can be done in the open air. The casual ease with which the Japanese undress, making modest use of a small towel, seems in strange contrast to the prurience of the comics and the sex shows. But the idea of appropriate behaviour in appropriate locations is accepted in Japan as it is on any Australian beach. The capacity to distinguish between nakedness and nudity is not necessarily a Japanese invention.

WESTERN male fascination with Japanese morality or its absence has been around for a long time. Hartcher's story is the latest rerun of a very old movie. Japan was slaveringly described to Western readers in the 1880s as 'a country of nudity, lewdity and crudity'. Joseph De Becker's The Nightless City was a best seller in Europe between 1899 and 1905. The uninhibited mores of ancient Japanese society have been overlaid by successive historical strata, including Confucian sexism, Victorian prudery, missionary-style repression, and modern libertarianism. Contemporary official morality in these matters, which concentrates on blotting out pubic hair but permits representations of sado-masochism, has been described as 'delicate'.

The Australian artist Stelarc's speciality is the exploration of the body as a machine, as a suspended object, with laser eyes, amplified internal noises or replicable moving parts, like his Third Arm. He was able to develop his installation technique during 17 years in Japan, with the help of many Japanese collaborators. Clothing is intrusive in his work. The insertion of steel hooks through the skin might be more likely to shock people than the unclad body. But time and again his suspension events ran into Japanese insistence that he bandage his penis and particularly that no pubic hair be visible. This, in the country that used to have no-panty bars.

Les Murray's verdict that the Japanese, so sophisticated, so Western, are yet 'askew by a fraction' is a tempting explanation of the conundrum, carrying with it implied reassurance that the West is the norm, and that Australia is part of the West. My publisher sent a copy of my book *The Yellow Lady* to Japan, to a company which had expressed interest in translating it, and he was surprised when they abruptly turned it down, saying they didn't like the cover. Then I realised, with horror, that they had seen the paperback, with Bert Flugelman's sculpture, *Tattooed Lady*, on the front. Covered though she is with Japanese erotic *ukiyo-e*, in the manner of Takeda's prints, she is Western and hirsute. I had be surprised if they even opened the book. The hardcover edition, with Norman Lindsay's etching on the cover, is to my eyes much lewder, but being virtually hairless, it would probably get by in Tokyo. In 1985, Japanese customs would not allow several prints by Arthur Boyd to be exhibited in Tokyo for similar reasons.

I could go on, as many other writers have gone on for years about sex and the Japanese. Nicholas Bornhoff in *Pink Samurai* devotes 479 pages to love hotels, nude theatres, fertility festivals, erotic comics, telephone call girls, Soapland masseuses and their historical precursors. Ian Buruma in *Behind the*

ILLUSTRATION COURTESY OF MADE IN JAPAN, MELBOURNE, AND HONJO GALLERY, JAPAN

Surprise Attack at Hiydorgoe by Takeda Hideo

Mask and in *A Japanese Mirror* gives an account of 'Sexual Demons, Sacred Mothers, Transvestites, Gangsters, Drifters, and Other Japanese Cultural Heroes'. John David Morley in *Pictures from the Water Trade* and Boye de Mente in *Bachelors' Japan* explore the pleasure quarters where Japanese have for centuries repaired for refined dalliance or rough trade. All, including the author of *Geisha*, Lisa Dalby, who herself trained as a geisha, devote forests worth of pages to who does and who doesn't do what and to whom. It's significant that foreign onlookers at the annual Japanese phallic festival now outnumber Japanese by four to one.

BORNHOFF chronicles hundreds of years of guilt-free licentiousness alternating with periods of officially imposed austerity. The red lights have been on again and off again for centuries: off when luxury and excess went over the top, or when censoriousness ruled, on again as the *mizu shobai* system seeped back. No sooner was Japan opened to the West in 1853 than European men heard tales and saw prints of a Mikado-land of silken geisha and unfettered delight. Americans claimed that the Japanese language had no word for 'chastity' and hence no holds were barred. (In just the same way, Thomas Jefferson declared that since a black woman could not blush, she knew no shame). Australian men, too, travelled to Japan to sample mixed bathing and other delights which, as James Murdoch recorded at the turn of the century, were to be had 'dirt cheap'.

What we are hearing now about the Japanese Imperial army's 'comfort women' is little different from the fate that awaited Japanese girls from poor families in the Edo and Meiji periods, who were sold or abducted into the *mizu shobai*, the 'water trade'. 'Behind the gaudy facade of the licensed quarters and the silks of the inmates' clothing,' says Bornhoff, who reproduces a photograph to prove it, 'were thousands of country girls in bondage, most of whom accepted their lot with quiet fatalism and dreamed of better times.' Yesterday's Japan is today's Thailand. In a society in which women are impoverished, uneducated, and denied physical and economic mobility, the 'water trade' will flourish. They may be kept down, indeed, just so that it can continue to do so.

In 1892, Murdoch, a journalist who later became Professor of Japanese at Sydney University, wrote graphically of an encounter with an 'Oriental seductress' in Japan. A century later, in 1991, Dennis O'Rourke, Australian filmmaker, made a documentary about a Thai prostitute, calling Bangkok 'the Mecca for Western men with fantasies of erotic sex and love without pain'. A recent play by the British playwright Anthony Minghela is called, with *double entendre*, *Made in Bangkok*. It's significant that none of the literature about cheap, endlessly available sex-slaves in exotic

"Japanese refuse to abandon their ancient religious traditions, their enmity towards Russia, their 'nuclear allergy', or for that matter, their views about women. Politicians still make unblushingly racist and sexist statements. They still balk at permitting women access to the contraceptive pill, while abortion is used routinely."

locations, used and later abandoned, now or a century ago, is by women.

The 'water-trade' finds its own level, the level of economic dominance. Now Japan has largely priced itself beyond the means of the Australians who want exotic sex dirt cheap. Japanese men take expensive sex tours to the Korean island of Cheju, to Manila, to Bangkok, and frequent upmarket establishments reserved for their use. Australian women dance in Shinjuku and serve drinks laced with innuendo in Roppongi, typically claiming that they despise their clients and that they don't take work home. Australian men, if writer James McQueen is an authority, are being forced down by a falling dollar into 'lower latitudes'. As in private medicine, each gets what he can pay for. Meanwhile, in Japan, salarymen and office ladies pay plenty to Love Hotels to be transported in fantasy to somewhere else, in beds like galleons, gondolas, or space shuttles.

THE EVIDENCE is abundant that, at least in matters of sex, human nature seems to be universal or, as the Japanese condescend to admit, foreigners have human feelings too. In spite of this, an industry based on the obverse proposition, that Japanese are unique, has flourished ever since Japan's first contact with the West. Japanese have asserted their uniqueness, superiority and impenetrability, and non-Japanese have either believed it and fawned upon them, or rejected it and fumed at them. The mountains of literature on the subject produced on both sides form twin peaks. In recent years, in reaction to the adulation industry, 'hate-Japan' writing has dispensed vitriol in varying doses: it includes Michael Montgomery's Imperialist Japan: the Yen to Dominate, Michael Crichton's Rising Sun, and Karl Von Wolferen's The Enigma of Japan: People and Politics in a Stateless Nation. Australia's own Russell Braddon has contributed The Other 100 Years War – Japan's Bid for Supremacy 1941 – 2041.

In the 1990s, the worm is turning. Exasperated with being told by the West, particularly by Americans, what is wrong with them, many Japanese bought the book and the message of *Japan – the Country that Can Say No.* If there is truth to the claim that Japan is unique, it rests upon the fact that, alone among nations, the Japanese always believed they were superior to the West, and unlike the Chinese, rapidly proved in certain fields it in the twentieth century. The Japanese – now here's a sweeping statement – are never content to leave things as they are. (There's some excuse for generalisations about a virtually homogeneous society like Japan, where non-conformity has traditionally been repressed.) The Japanese develop, advance, refine everything. They don't necessarily make things more complicated: refinement can be shrinkage, or simplification. But they make everything into an art form. Look at Korean architecture, or ceramics, or calligraphy, or silk fabrics, and then at Japanese. Look at Chinese paper, musical instruments, porcelain, fans, screens, lanterns, and then at Japanese. Look at American cars, radios, and tape recorders, and at Japanese.

The Japanese have made modern-day art forms out of the British rituals of name-cards, golf, and the Royal Family. They have turned the idea of Parliament into Japanese performance art. In the 1950s, Indian and Chinese meditative disciplines were internationalised by the Japanese as Zen. In the 1960s, student demonstrations became peculiarly Japanese snake-marches. In the 1970s, classical music was instilled into millions of children by Suzuki. In the 1980s, Kurosawa and another Suzuki passed Greek and Shakespearean drama through a Japanese prism. Today, the young who dance in the street at Harajuku have transformed rap into something new and strange.

That isn't to say that change is not stoutly resisted. Japanese refuse to abandon their ancient religious traditions, their enmity towards Russia, their 'nuclear allergy', or, for that matter, their views about women. Politicians still make unblushingly racist and sexist statements. They still balk at permitting women access to the contraceptive pill, while abortion is used routinely. A Japanese woman, Doi Takako, became head of a major political party before any Australian woman had done so, but few other women occupy publicly powerful positions, and many are still forced to resign on marriage. 'This country', says Mitsui Mariko, a member of the Tokyo Metropolitan Legislature, 'is 40 years behind the rest of the developed world in its social attitudes.' She has been patronised, propositioned and felt up by her political colleagues, and then attacked and forced to resign for going public with her complaints.

My friend Mari is 30 and has excellent English and a degree in international relations. She was recruited by a Japanese bank as a financial analyst, and trained in New York for three years. She then married, and has now been retrenched as part of 'restructuring',

even though she has no children. Many young women in full time work find it incompatible with the stringent demands the system places on mothers, and in many cases, motherhood wins. In four generations, the Japanese family has 'progressed' from extended to nuclear, rocking traditional values on their foundations. A debate rages in Japan at present over whether the young diplomat who has just become the new Crown Princess is doing Japanese women a favor by showing where brains and sophistication can get them, or whether she has let the side down by giving up her career for marriage.

BEFORE we throw up our hands and label Japan a man's country, let's not forget that Australian women occupy a disproportionately small number of top positions in business, law, Government, universities, churches and parliaments. Let's remember that free mammograms are still not available in Australia, in spite of breast cancer being one of the highest causes of death for women. Let's notice that some of the provisions of the Convention on the Elimination of Discrimination Against Women have not entered into law in Australia, and that domestic violence against women remains endemic. I have never been inhibited in doing my job as a diplomat in Japan, but I and other women have been denied access to the Melbourne Club on the sole grounds of being female. Men in Australia are as adept at keeping the top jobs for themselves as they are in Japan.

So what, then, are we to make of accounts of Japanese society by people who are able to compare it expertly with the West (that is, in most cases, with the United States): writers like Nakane Chie, Maruyama Masao, and Doi Takeo? All of them believe that while Japan is not faultless, it is unique. Doi in particular has had great influence with his theory of *amae*, childlike dependence. *Amae* can exist between men, and was part of the misogynist samurai code, which Mishima Yukio sought to revive in the 1960s and 1970s with his band of gay male sycophants. Doi has convinced many foreign readers that the indulgent relationship between Japanese mothers and infants underlies perverse and tyrannical behaviour by some men in adult life. *Cherchez la femme* has for long been the rallying call for foreign and Japanese men alike seeking a scapegoat for society's ills.

Doi defines and redefines his terms, not only the noun *amae*, but the verb *amaeru*, and the concepts of *giri*, *ninjo* and *on*, *tatemae* and *honne* which are reasonably well understood by even amateur students of Japanese. He uses, though he did not invent, the technique of claiming that because he cannot precisely translate these terms into English, the ideas to which they correspond do not exist in the West (North America). This way of mystifying Japan provides him, as it does foreign explicators of Japanese society, with a maze down which to duck if their readers ever look like catching up with them. They are Japanology's high priests, holding the keys to its mysteries but snatching them away at the last minute.

Amae is rather close, in fact, to the Australian concept of mateship, the giving and receiving of dependent trust. Its application to the parent-child relationship is well known in the country which created *Mother and Son*. Its national application is familiar to Australians in the cultural cringe to Europe, the 'great and powerful friends' relationship with Britain, and the 'all the way' or 'Waltzing Matilda' relationships our leaders subsequently claimed with the United States. In relationships between individuals it is learned in school playgrounds, where the bully recruits the nipper, or the prefect the fag. The Japanese make much of the *oyabun-kobun* relationship between soldiers, or between gangsters, but it's much the same as the relationships on which the internal workings of an Australian political party machine, a labour union, a church hierarchy, or a football club depend. Australians claim mateship is egalitarian: but as a male self-preservation strategy it is as vertical as anything in Japanese society.

The *amae*, or mateship, relationship replicates mother-love while rejecting it. To prove themselves as mates, men have to deny what they most desire. Many men exclude women from much of their lives while still needing to include them. They fear intimacy while longing for it, they desire commitment while withholding it, and they replace pleasurable eroticism with emphasis on the parts instead of the whole. In these ways Japanese men – now here's another generalisation – are little different from Western men, deep down: they replace their mothers with Mama-sans. But they make the difference into an art form.

IT IS OF CRITICAL importance for Australians to know their way through the maze of contradictions and paradoxes that is Japanese society, since our trade and regional relationships are and will remain tethered to Japan well into the 21st century. But can we predict or control where Japan is going, with Australia in tow?

Some pessimists foresee social, political and economic upheaval or collapse by the turn of the century. Others, Japanese and foreign alike, observe signs of renascent fascism. Many lay the blame for what they see as the fecklessness of the young and the abandonment of the old on working women. But does this mean Japanese society has lost the plot? Highly unlikely, in my view: Japan has survived much worse times than these. 'The shrewd observer of the modern scene,' wrote Ejima Kiseki, 'will note that sons are altogether inferior to their fathers, and that the grandson rarely offers hope for improvement.' Ejima wrote this in 1715. ★

Joanne Painter

Megaprojects

The megaprojects mantle has passed to the Japanese, but it is a mixed blessing. Environmental impacts seem likely to subvert any material benefit, leaving the motives for these grandiose schemes open to question. Are they really designed to improve life? Or are these symbols of Japanese economic power and technical prowess a surrogate for sabre rattling, and a way of keeping the wheels of the powerful 'political-construction complex' turning?

SOMETIME between constructing the Empire State Building and opening Disneyland, America lost its passion for scale. No more would it build the biggest, fastest, weirdest or most expensive projects a modern state could dream up. That honour went to the Japanese who embraced it with an almost religious zeal.

While America struggled with economic entropy, the Japanese were busy redefining the mega project. And to ensure their economic and technological pre-eminence does not go unnoticed, the Japanese have built or plan to build a few small reminders: the world's longest bridge, fastest train, smartest building, largest amusement park ...the list is long.

In the landscape of the future, Japan stands out like a skyscraper amid tenements. Neon splattered, chrome plated, glass fronted and technologically smug, it dwarfs its neighbors in both scale and daring.

Japanese planners, aided and abetted by the political-construction complex, have pushed the frontiers of scale to levels that inevitably involve mega-environmental impacts.

Japan's futuristic version of the Empire State Building soars 800 metres into the sky from its mooring in Tokyo Bay and houses a self contained city. Built on reclaimed land mined from nearby mountains, the Millennium Tower is to the 21st century what the Empire State Building was to the 20th.

Say its designers: "The twentieth century building has replaced the nineteenth century factory as the central villain of alienation and dehumanisation." To over come this problem, the tower features all the cultural amenities of a modern city encased in a fully controlled, hermetically-sealed environment.

Disneyland Japan-style is bigger and vastly more technologically advanced than its American parent.

Inevitably, these audacious projects engender deep concern, and hostility, among some sections of the population. Environmentalist Maggie Suzuki believes they are the biggest threat to Japan's environment. Australian academic Professor Gavan McCormack says they are symbols of Japan's spiritual impoverishment and international isolation.

He also links the rise of megaprojects to institutionalised corruption. "Grandiose and visionary schemes, frequently with disastrous consequences, have characterised the last several decades of Japanese planning and have become increasingly ambitious as bureaucrats seek solutions to the present (corruption) crisis. The channels through which such projects are organised are deeply entrenched and (are) a fundamental part of the process of reproduction of the Japanese political economy as a whole (often referred to by the term *'doken kokka'* or 'public works state')."

In Japan today there are thousands of major projects being built or in the planning stages. In the Kansai area alone (Osaka, Kyoto and four neighbouring prefectures), 260 major projects each costing $10 million or more are planned.

The combined value of these projects is $300 billion. The truly large projects, however, start with budgets of $1 billion and up.

Some of the big ticket items under construction or planned for Tokyo include the world's longest bridge (cost: $10 billion) over Tokyo bay (a second is also planned); extending the capital by constructing a 30,000 hectare island in Tokyo; a new $11.5 billion airport in Tokyo; the world's longest suspension bridge linking Kobe with Awajishima island (cost $6.1 billion) and a high speed bay area expressway.

The sheer expense of the projects is matched only by the physical effort needed to turn visions into reality.

Take the proposed island in Tokyo Bay for example. To build the 30,000

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hectare island and associated canals would require 8,400 million cubic metres of fill, 125 times that excavated to construct the Suez Canal. The cost of building the island, which will house five million people, is $2,450 billion – 20 times more than the Apollo space program.

An entire range of hills in Chiba prefecture is being levelled to produce 900 million cubic metres of fill to build the bridge over Tokyo – 12 times that required to build the Suez canal.

Professor Gavan McCormack, of the Australian National University, links the rise of megaprojects in the 1980s to the rise of the public works state or political-construction complex (a Japanese version of the American military-industrial complex).

CORRUPTION and construction in Japan go hand in hand, he says. "After the war, in the 1950s and 60s, the emphasis was on building dams, power systems, etc. Much of it was necessary, but there was also an amount that was unnecessary. It went beyond infrastructure building. The circuit of corruption built up from there.

"In the 1970s and 1980s, corruption and the construction industry became self generating (and) independent of social need, while the political system developed in such a way to make it necessary for these things to be done."

He asserts corruption is so institutionalised "that all major construction companies cream off the top two to three per cent of all contracts for (redirection) back to the Liberal Democratic Party".

One reason for the ever increasing links between megaprojects and institutionalised corruption is the question of what to do with Japan's vast wealth.

Its GNP has multiplied 152 times in four decades, from one per cent of world GNP in 1950 to 13 per cent in 1990. During the 1980s boom, its economy expanded by a 'Korea sized economy' every year. In the same period the proportion of public investment in GNP rose from 6.1 per cent in 1966 to 16 per cent in 1990. Japan is now the world's largest investor in public works.

When its trade surplus began to cause friction in the early 1980s, Japan agreed to a massive program of domestic investment. But rather than invest in a military or welfare state as America, France, England and Germany had done before it, Japan became a construction state.

There are few better examples of the public works state in action than the network of leisure cities planned for the Kansai area. The 260 projects planned include the world's largest artificial island (site of the new Osaka International Airport), a purpose-built cultural city with research and teaching facilities, and a network of elaborate leisure cities.

Plans to build an entire resort island on reclaimed land are already well advanced. And Kobe Leisure World, estimated to cost $200 million, is scheduled to open in March, 1994.

Yet despite the grandiose nature of the projects, there are few links between them. Nor is there any demonstrable need. "They operate as individual entities with no particular planned interaction and no concern for protection of the environment. The point in common is that many of them are jointly funded by local governments and private consortiums. They are thus supported by the tax payer. One Japanese economist has referred to these projects as 'construction economics without overall planning'," Melbourne University academic Mr Yuki Tanaka argues.

The underlying reason for these projects is economic. "At 20 million, the population of this confined area of Kansai far exceeds that of Australia, as does its GNP of $480 billion, 2.3 times that of Australia. This makes it capable of supporting so many grandiose projects that are really only of financial benefit to developers and construction companies.

"A recent phenomenon is public works changing from the building of basic infrastructure to the setting up of so-called private resort towns all over Japan. This is mainly due to two reasons: first, basic infrastructure such as highways, bridges, tunnels and airports have already been constructed throughout Japan, leaving little space for new projects today; second, the resort industry is developing in Japan at an amazing speed...There appears to be an intimate relationship between the conservative politicians of the LDP and the construction and real estate companies," Tanaka says.

"Corruption continues to this day and there is little prospect of a crack in that. Now people are very angry and they have been offered a sacrificial lamb in Shin Kanemaru (LDP kingmaker), but the whole system is at risk if you take away corruption," Professor McCormack says.

While Japan's political and economic interests are intimately entwined, its great power status is also

fundamentally linked to megaprojects. For a country without the ability to project its global power through military force, economic colonisation is a handy substitute. "In my view, megaprojects are more important than battleships. They are great symbolic representations of (Japan's) global power," Professor McCormack says.

But rather than enriching Japanese culture and benefiting the world, Professor McCormack believes Japan's fetish for grand visions and megaprojects is a dangerous sign of cultural impoverishment and increasing isolation.

"The idea that the Japanese people should be mobilised to level mountains and fill in the sea lest the force of their impact on the outside world provoke uncontainable anti-Japanese sentiment, or even lead to war, is a fundamentally impoverished, even deranged view, redolent of despair in preferring to tie the Japanese people to the treadmill of endless – and meaningless – growth rather than face the possibility of constructive, imaginative engagement with the world."

One of the earliest victims of Japan's preoccupation with nature transforming projects has been the environment.

Maggie Suzuki is a coordinator for Friends of the Earth (Japan) and co-edits the environmental newspaper Japan Environment Monitor. Although she acknowledges the fledgling environmental movement is fighting a losing battle against megaprojects, she believes it is a life and death battle.

"The scale of public works projects in Japan is a bigger threat to the environment than anything else. There are so many of them and they proceed without any assessment of environmental impact.

"They proceed because there is this tremendous bureaucratic acquiescence driving them. And they are accepted by local communities because they put an awful lot of people to work, create wealth and spread *Amakudari*." (*Amakudari* literally means 'descent from heaven' and refers to the system under which bureaucrats who help promote certain company's interests are given lucrative consulting jobs when they retire.)

Megaprojects

1. WORLD'S LONGEST BRIDGE, over Tokyo Bay between Kisarazu City Kawasaki City, $ 10 billion, projected completion March 1996
2. Construction of 30,000 Ha Island in Tokyo Bay, $2,450 billion
3. TOKYO AIRPORT, $11.5 billion, completion date 1995
4. KANSAI AIRPORT (Osaka Bay), $10.7 billion, projected completion Spring 1993
5. KANSAI CULTURAL AND ACADEMIC CITY,Y40 billion, projected completion early next century
6. OSAKA TECHNOPORT (telecommunications and trade centre), Y3500 million, projected completion 2010
7. WORLD'S LONGEST SUSPENSION BRIDGE (3910 metres) between Kobe and Awajishima island, $6.1 billion, completion 1997
8. WEST KOBE NEW TOWN (pop 30,000) Y8469 billion, projected completion 1994
9. KOBE LEISURE WORLD, Y1500 million, projected completion March 1994

THERE are currently more than 16,000 environment groups operating in Japan. Many formed in response to huge leisure developments, the loss of agricultural land and urban encroachment. One of the largest green social movements, the National Network Against Resort and Golf Course Development, formed in 1986 to fight the tide of resort and golf megaprojects.

Yet the tide continues. Despite its unsuitable terrain, Japan has more than 2,000 golf courses. Resorts are equally populous. A 1991 study found 17 per cent of Japan's land area was slated for resort development. The 313 priority developments accounted for 2.5 per cent of the land mass.

The sheer size of the developments, coupled with the power of the construction state poses a daunting task for environmentalists. Japan's untrammelled growth has all but destroyed the natural environment. In a land where the environment is revered, only one per cent of old growth forests remain. Only five per cent of its coastline is undeveloped. The fight to save the Nagara River, Japan's only remaining major natural river which hasn't been dammed, has dragged on for 10 years.

Maggie Suzuki believes the environment will continue to suffer until political attitudes change. "People in Japan do not vote on issues and politicians do not have platforms. People vote on the basis of loyalty or business connections. We are trying to change that by putting forward environmental candidates. It is a slow process," she says.

But Japan will be held to account by its own environment for any mega-mistakes. Like a bureaucrat dependent on *Amakudari* for future wealth, Japan may find the source of its wealth to be a difficult master. ★

Gavan McCormack

How Japan faked its own history

The Japanese consider themselves special and unique, and long nurtured the idea that Japan itself is a land directly founded by the gods, rather than coalesced about the 12th Century from various communities that co-existed on the islands of the archipelago. Though this multi-layered invention was discredited for a time by the defeat in 1945, it has proved remarkably persistent. The now ingrained notion of divine origin and racial superiority is based on myth and fabrication, invented by ideologists of ancient Japan to conceal the realities of diversity – and the probable foreign origins (among rival kingdoms on the Korean peninsula) of the imperial family. The sub-text of these claims of racial purity and superiority is insecurity, fear and negation, and the result is twofold: a Japan increasingly isolated, and a nation blocked from understanding itself by its continuing insistence on the spurious uniqueness of being Japanese. Despite its economic internationalisation, Japan is facing an identity crisis as it seeks to play a commensurate social and political role in its region and the world. As Japan struggles now to open itself and define a new role in the world, these ancient myths, and the mentality rooted in them, are a serious impediment. In a masterly analysis, Gavan McCormack looks behind the mask of consensus carefully fixed over identity, and suggests that to achieve its true identity, Japan may have to renounce the very things that brought about its rise. It faces the challenge of shedding the mask of 'Japaneseness' as a unique, imperial essence, the mask it has worn for over a thousand years.

A NATION'S quest for identity is an evolutionary process, both conscious and unconscious, and – like evolution itself – sporadic, at least in its visible forms. In the thaw after the Cold War, the quest for identity flared up with renewed force. Attention turned to who people were, how they differed from their neighbours; it precipitated a search for identity.

The quest for 'true' identity led often into layers of atavistic fantasy about the nature of racial, ethnic, or cultural orders, in which the simple, pure and holistic was preferred to the complex or the real.

The process is at work in Japan as elsewhere, with a peculiar force precisely because contemporary Japan is the favoured child and beneficiary of the Cold War, but also because deep-rooted historical questions have never been resolved, and because the long-term goals of the modern Japanese state – wealth, power, and equality of status with the West – having been achieved, the achievement was experienced as hollow. Where was Japan to go from there?

The contest between rival conceptions of Japanese identity is fed by Japan's rise as an economic superpower in an increasingly borderless world. Its deepening engagement with the world on economic and other fronts raises questions about orthodox formulations of 'Japaneseness' stemming from antiquity, and how/whether 'Japaneseness', and modernity in the political sense of a civil society, can be combined.

Japan's modern triumph was achieved at the cost of a series of negations and fabrications about its origins and essence which are now increasingly visible. Rendered visible, the compulsion of the mode which operated behind screens, by use of mirrors, myths and magic, is lost. Once revealed, the subject of the negations of the past regains voice and enters into the discourse about the construction of the future; the fabrications become capable of transcendence. The myth of 'Japaneseness' as the quality of a monocultural, blood-united, pre-ordained people confronts the historical reality of the emergence of the earliest Japanese states out of a complex of more-or-less equal communities which traded, contended and communicated across the islands and peninsulas of the adjacent continent. The series of fantasies which were imposed over the people of the archipelago fed external distrust (and eventually brutal aggression) and, internally, a hierarchical structure in which dissidence and difference

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Quest For Identity

were negated. But the fantasies, rather than being negated, were entrenched.

Official myths only lose their power through the historian's labor of deconstruction and exposure. The deconstruction and re-imagining of the Japanese past offers hope for a recreation of tradition through which Japan might in due course be able to present the sort of vision for the future which would satisfy world pressures and expectations. History in the 1990s is therefore political, and contested, in a sense as profound as during the 1930s; the Japanese question – 'Who are we?' – resumes the centre stage of historical and political debate.

Many commentators point to the current Japanese problem of isolation in the region and the world. German observers, whose experience in many respects parallels the Japanese, are especially sensitive to it. The hypothesis of this analysis is that, for Japan, the quest for a sense of ease with itself, its region and the world, is blocked by the set of values and ideas associated with its own rise: the notion of Japan as a special land, directly founded by the gods, superior to its neighbours. The deep conviction of uniqueness is reflected in a whole vocabulary of terms.

The core to the whole system of such values, once known as *kokutai* (national polity), more recently as *Nihonjinron*, is the emperor himself, the greatest blockage to Japan's engagement with the world, the only structural impediment yet to be named by Washington, the taboo of taboos, the repository of the ultimate magic. This is another reason why the historical debate is profoundly political.

The sword of primordial Japaneseness is, however, double-edged. It was just such 'Japaneseness' which, through creating a sense of membership and unit solidarity and fostering it through the following centuries, facilitated Japan's remarkable, if at times terrifying progress, especially in the 20th century. But it was also the tragic blemish that increasingly bedevilled the Japanese enterprise.

'Japan', according to Amino, began in the late 7th century in the *'ritsuryō'* or legal code state of Western Japan around the chieftain who used to be called *'tennō'*. Essential elements of a superior, monolithic and racist ideology were concocted by the ideologists of the ancient Kinai courts, as they appropriated the name *'Nippon'*, perhaps linked to the pretensions of the early emperors as sun princes (*hi no miko*).

The state built around the Kinai region gradually extended its domain. The intellectuals of the time, the Voodooists of ancient Japan, served it by formulating out of folk memory and legend a dominant text of unique, divine, imperial identity. To compensate for/or to conceal the realities of diversity and (probable) foreign origins of the imperial family among the tribes of the adjacent peninsula in Korea, a direct descent from the sun goddess was claimed. The notion of superiority writ large in the texts actually declared, in its contrapuntal sub-text, insecurity and fear. And the ideology of a chosen race united around a divine emperor was incompatible with harmonious relations with neighbour states.

Their domains, whether known as Yamato, Kinai or Nihon, remained for long relatively insignificant, coexisting even on the Japanese archipelago with other social organizations, other states. But their power as 'Japan' encroached gradually upon the rival centres within the archipelago. It was around the 12th century before a pattern of culture and authority had emerged which was sufficiently homogeneous for the consciousness of living in 'Japan' to have become widespread throughout the islands.

The notion of the Japanese people as a homogeneous, pure, rice-growing and rice-eating people, distinct from antiquity, whose essence was most purely distilled in the person of the emperors, though powerful and deep-rooted, is a myth. The elements of this ideology and polity which originated in Kinai and for convenience may be called *'Yamatoist'*, having filtered slowly through the archipelago, were woven into a fabric of exceptional coherence and suasive force during the 17th and 18th centuries by the scribes of the so-called 'National Learning' (*Kokugaku*) school. These scribes codified the original legitimating myths of the Yamato founding fathers, projected back upon that age the notion of a lost, 'golden age' utopia, when the gods communicated directly with humans, and saw the link with this pristine age as preserved through the sacerdotal family of the *tennō*, who maintained (and embodied) the *kōdō* (imperial way). All that impinged upon Japan from outside over subsequent millennia was inferior and defiling, including the very notion of Chinese learning. Motoori Norinaga (1730-1801) expressed the point beautifully:

'Magokoro o tsutsumi kakushite kazaraite
Itsuwari suru wa Kara no narawashi'

For which a rough translation might be:

'Enveloping, concealing, embellishing
the true heart,
and deceiving it:
Chinese customs.'

If Chinese learning represented no less than the Fall from pristine grace, how much the more so other, subsequent foreign influences. The notion of a unique, pre-foreign, superior polity, preserved in essence in the *tennō* institution but

"Japan's modern triumph was achieved at the cost of a series of negations and fabrications about its origins and essence which are now increasingly visible. Rendered visible, the compulsion of the mode which operated behind screens, by use of mirrors, myths and magic, is lost...the fabrications become capable of transcendence."

shared in some measure by all 'Japanese', became an integral part of the national polity, or *'kokutai'*, codified in the early 20th century and still retaining considerable sway today. *Tennōsei* (emperor system) subsumed also much of the popular folk ethic and aesthetic of 'simplicity' (*soboku*), 'sincerity' (*magokoro*), harmony with the forests and kami, but by subordinating this to the imperial cult – for long turning the shrines, those focal points of popular animist religion and festival, into centres of imperial cult – subverted it fatally. Here was *'itsuwari'* (trickery) far more profound and damaging to the *'magokoro'* (or pure heart) of Japan than Chinese learning.

Though this version of Japanese identity gained the imprimatur of official sanction, it was by no means the only one generated by people within the country. Apart from the political contention that was reflected in the co-existence of separate states within the archipelago, there was ideological contest too.

Thus it was that in the 1880s the farmers of Itsukaichi affirmed democratic and rational elements of modernism as a fulfilment of tradition, while the court and political elites felt threatened, since they faced, or seemed to face, a challenge to official notions of Japaneseness built around the imperial family. The universalist principles affirmed by Japanese commoners were therefore rejected as heterodox, foreign and subversive, which meant that they were incompatible with the unspoken taboos surrounding the imperial institution. Intervention was necessary to preserve 'Japan' against those who would dissolve its unique and special imperial subjectivity.

The idealism and energy with which the Japanese people worked to build the nation out of feudalism and closedness into a modern, industrial state is unquestioned. However, the channelling of that energy and idealism through the myths defined by the National Learning scribes meant that ideological 'closedness' (*sakoku*, literally 'closed country') continued though the country was in other senses 'opened' after Meiji (1868), and in some respects this 'closedness' continues till the present day. While the dominant strain of 18th century *kokugaku* thinking proved a powerful instrument for the ruling establishment to mobilize the Japanese people under the emperor as divine centre of the race, and project Japan as a dynamic nation into the world in the 1890s and again in the 1930s, the same mythology made it difficult, if not impossible, for Japan to be accepted within the world. It is no mere coincidence that the prewar structures of family state (*kazoku kokka*) and imperial army (*kōgun*), and the post-war structure of the Japanese business enterprise (*kigyō*), are similarly hierarchical, authoritarian and absolutist, or that 'internationalization', relating to other countries, presented such enormous problems then and continues to do so now.

Faced with the question of how to relate to its nearest neighbours in the pre-war period, Japan chose alternately the apparently opposite policies of 'sloughing off' Asia, and embracing it. But the idealism of both policies (*'datsu-A'* and *'Ajiashugi'*) alike was predicated on the inherent difference and superiority of Japan; in the former case because Japan was to set itself apart as non-Asian and therefore superior, in the latter, because it assumed that the only way for Japan to 'return' to Asia was as leader (*meishū*), in a hierarchical, vertically structured alliance of nations, in which, needless to say, any *other* leader was unthinkable. All the world was to be brought under the benevolent family roof of Japan (*hakkō ichiu*).

WHAT this analysis argues is that, to present a credible, universalist message to the world, what Japan has to slough off is not its 'Asianness' but its 'Japaneseness', to negate what has been maintained as the central core of its officially-defined identity. Yet it is precisely this capacity for self-negation (*jikō hitei*) that has been conspicuously lacking at official levels in modern Japan, and the identification of the deep 'self' with the *tennō* as Japan's true and singular 'subject' makes it particularly difficult to achieve.

The point perhaps emerges clearly if, alongside Japan's contemporary and well-known difficulties in relating to the world, its earlier attempts were considered. The most 'successful' Japanese attempt at expansion is commonly thought in Japan to be the Manchukuo episode.

After 1931, Japan had to face a problem it had not faced before: to develop an ideology and practice of 'internationalization' (*kokusaika*). It needed to be able to justify the continuance of a set of special Japanese rights and interests without claiming simple Japanese dominance and hege-

mony. Clearly there should be lessons to be learned from this Japanese experiment in 'multi-culturalism and co-existence'.

Japanese settlers and employees of the South Manchuria Railway Company, who had developed some degree of attachment to Manchuria, imagined a new post-imperialist, anti-communist, and multi-cultural state, whose spirit they gradually formalised through a vocabulary of appropriate terms ('autonomy' and 'inter-racial harmony'), institutional structures and symbols.

However, the reality beneath this glossy representation was one of comprehensive direction from Tokyo: the entire apparatus of state was an elaborate charade to conceal 'control by hidden manipulation' (*naimen shidō*) by the Japanese military, with Pu Yi (the 'last emperor') himself a puppet; instead of peace and equality there was constant violence and mobilization; in place of 'inter-racial harmony' there was entrenched Japanese privilege and discrimination.

IN a sense, all the victims of this disastrous Manchukuo experiment were victims of the National Learning school's success in formulating myths that dominated the unconscious deep structures of the minds of the Shwa thinkers and planners. This becomes most plainly evident when the process of constructing myth is considered. Take the case of determining the nature of the authority of the Manchukuo emperor. While the mass-mobilizing Concordia Society (*Kyōwakai*) promulgated (and many of its members believed passionately in) the themes of inter-racial harmony, equality of the five races, etc, the Kwantung Army insisted that a state cult which clarified the 'special relationship' between Manchukuo and Japan was necessary, and in the end a state cult based on Amaterasu, the mythical sun goddess who was supposed to have founded Japan, was chosen. In June 1940, Pu Yi visited Japan for the 2600th anniversary of founding of Japan and agreed that Japan would not be just ally, but mother country (*shinpō*), and that he would undergo the ceremony of incarnating Amaterasu, (by which he would become a 'Living Amaterasu' or 'Iki-Amaterasu'). In July, 1940, ceremonies modelled on Japan's *'Daijōsai'* were conducted by court officials sent from Tokyo. The three treasures of mirror, sword and jewel were solemnly adopted and a gaggle of *gagaku* court musicians performed appropriate music; the imperial portrait became an object of reverence and the morning ceremony of bowing to the palaces in Tokyo and Hsinking was inaugurated. The 'National Foundation Shrine' (*Kenkoku shinbyō*) was established as a surrogate Ise, and in August the 'National Foundation Shrine' (*Kenkoku Chūreibyō*) as a surrogate Yasukuni.

An entire tradition was created. So, of course, a millennium earlier it had been in Japan itself. But the crudity and deception of this enterprise were transparent and its failure inevitable. The attempt to create something 'new' ended in clone-like reproduction of the deep 'DNA' structure of superiority, uniqueness, and 'Japaneseness' (*kokutai*) that had been constructed by the National Learning scholars. This most important pre-1945 attempt at 'internationalization' ended in mockery of that goal.

The fatally flawed enterprise of Manchukuo is commonly acclaimed in Japan, however, as a model, a key foundation for China's post-1949 industrialization and a pattern which Japan might strive to emulate in its relations with South-East Asia. It is rarely criticized in terms of its revealing the internal contradictions of 'Japaneseness'. In the continuing discourse of identity, the deep structure of 'Japaneseness' hewn by the National Learning ideologues out of ancient Yamato myths remains privileged, and any challenge to the *tennō*-centred notion of 'Japaneseness' fiercely resisted. The modern ideological creations – flag, anthem, ceremony (of imperial burial and accession especially), and the struggle over the definition of national 'heroes' or 'martyrs' – also consistently privilege the most deeply embedded definition of identity. The special, unique and sacred 'Japanese national polity' (*kokutai*) of the 1930s remains fundamentally unchallenged in its dominance of the 'Japanese' symbolic world. Reference to the post-war imperial institution as *merely* symbolic has a nice irony, since of all forms of power it is precisely the symbolic which is most profound and unchallengeable (because unrecognized).

Japan's economic 'modernity' and power contrasts sharply with its encumbrance of pre-modern ideological survivals: the intense *étatisme* of the modernizing state's bequest resulted in a strong sense of *'kokumin kokka'* (nation state) but a weak sense of *'shimin shakai'* (civil society); the notion that the superiority of civil society over state is the desirable orientation of mature societies remains weak and narrowly based.

The circumstances of Japan's shift from defeat to occupation to the regaining of sovereignty as a dependent unit and a crucial front-line state in the Cold War polarization meant that the settlement of accounts with its own militarist past was checked, domestic responsibility was not debated and determined – Japanese courts did not begin to accept suits concerning war responsibility till the end of the 1980s – and the same conservative elites (minus only the military) who had guided Japan a generation earlier were assigned to guide it into high-growth, anti-communist

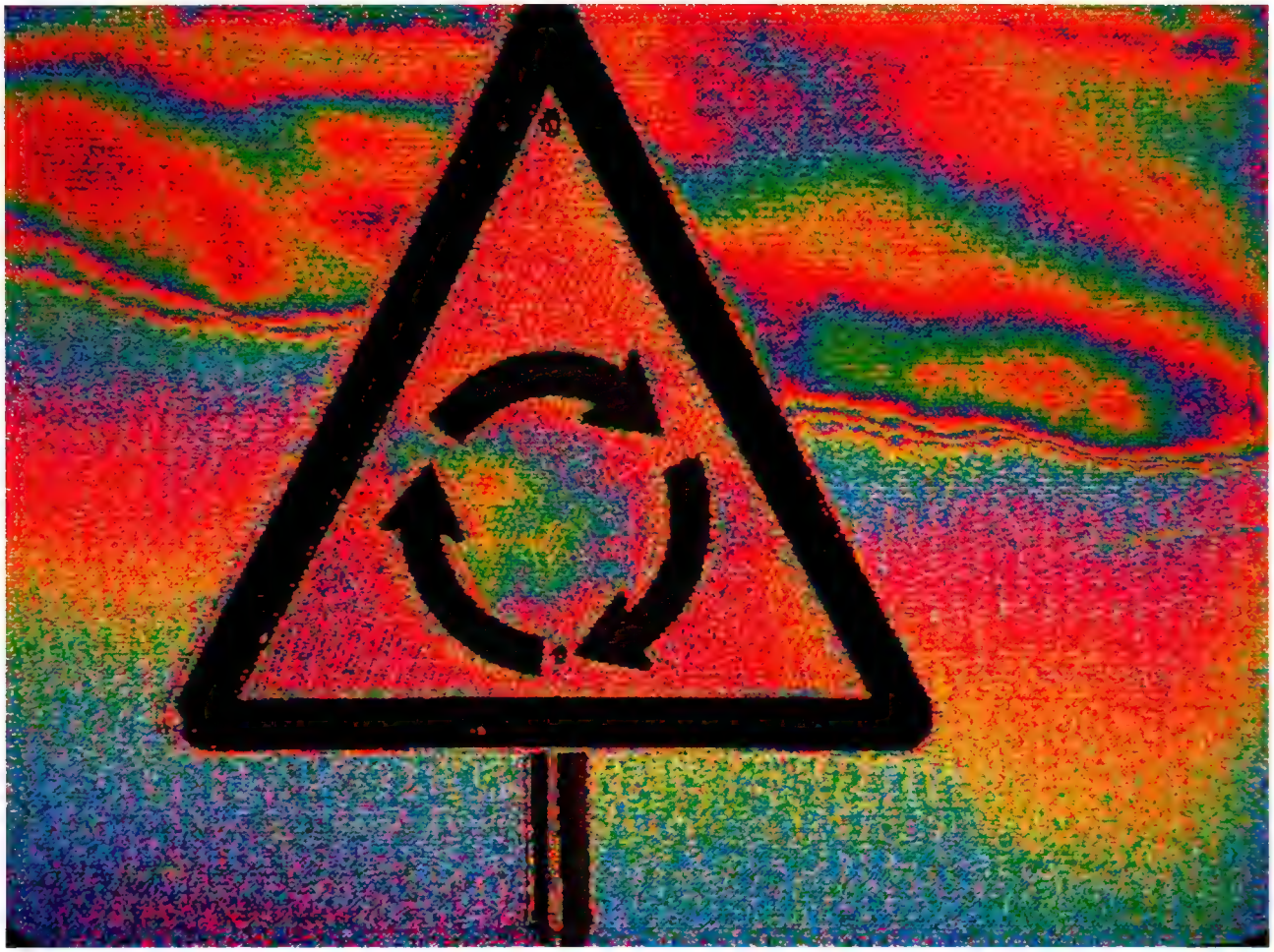


ILLUSTRATION STUART MCCORMICK

Roundabout

renewal. While the Cold War brought Japan great benefits, at the same time it distorted the evolution of Japanese institutions, blocking the process of coping with its own past and accommodation with its neighbours. The process of external reconciliation (and expiation) between Japan and its neighbour countries was forestalled by the Cold War walls that imperceptibly but almost totally cut Japan off from its region, accomplishing its second 'removal from Asia' (*datsu-A*).

As the first removal of Japan from Asia was followed by 'return', which reached a high point in the intense ideological campaigns to justify and legitimize superiority that crystallized in Manchukuo, so the second removal was followed by a 'return', after 'normalization' of relations with (South) Korea in 1965 and China in 1972, but while the economic sinews of the new relationship have become clear, the ideology has been muted. There is none (or little) talk of Japan as 'mother country' to Asia, or suggestion that the sun goddess be worshipped in Peking or Bangkok. The force of expansion by economic means is rational and secular; Japanese spokesmen are loath to interpret or attach any name to the emerging new order.

The problem for ideologists of Japanese expansion is to find in the repertory of culturally approved values any of universal appeal. Instead, the organic, essentially mystical, formula/slogans, imposed from above in attempt to pre-empt popular aspiration and mobilize and co-opt, have been preferred: from 'inter-racial harmony' and 'co-prosperity' in the 1930s and 1940s to the most contemporary 'symbiosis' (*kyōsei*).

FROM the beginning of the 1980s, prosperity fed the desire to go beyond 'economism' and elucidate the significance of the Japanese accomplishment. 'Internationalization' (*kokusaika*) became the Japanese watchword. It signified the greatly increased relative weight of the Japanese in the world economy, the structure of inter-dependence of a tri-polar world centred on Japan, North America and the European Community, and the high levels of financial, technical, human and goods flows between them. 'Internationalization', however, did not necessarily imply the internal transformation of Japanese society; rather it was accompanied by a continued, perhaps growing Japanese insistence that economic success demonstrated the unique qualities of the Japanese way – a superior, non-Western way. Other advanced countries

adopted the paradoxical attitude of trying to borrow aspects of the Japanese formula while at the same time insisting that Japan change to conform to their pattern. Yet the contradictions between Japanese hubris and Western resentment and importunity led to growing international friction. The politics of Japanese identity was transformed into a global issue, with the 'Structural Impediment Initiative' talks as its most prominent manifestation.

The very 'success' that creates this *kokusaika* continues to stimulate a Japanese desire to assert its 'identity' more forcefully, which in turn sharpens tensions both internationally and domestically, in an intensifying vicious circle.

IN the ongoing process, the repertory of imperial and *'kokutai'* myths of uniqueness, exclusiveness and superiority regained respectability and were articulated at the highest levels. The legal principle that the years should be known by the name of the reigning emperor was established (by the Gengh in 1979); Japan was declared by its Prime Minister a 'monoracial society' and 'a natural community' (*shizen kyōdōtai*), not 'a nation formed by contract', in contrast to the polyglot America, whose problems were put down to its large coloured population; the 'heroes' of Japan's past were gradually reinstated in school texts, including figures such as Admiral Togo Heihachirō – hero of the Russo-Japanese war of 1904-5, embodiment of the stubborn and irrational belief in superiority of Japanese spirit, and a famous opponent of reconciliation with the West in the 1930s – who was revived as role model in primary school texts from 1989; the purity and virtue of Japan's wartime mission in Korea and Manchukuo was reiterated; and the idea of restoring the shrine built to honour all who had 'fallen while punishing the country's enemies' (Yasukuni) as a national shrine was promoted by political leaders, especially Prime Minister Nakasone who in 1985 declared: 'Without such monuments of gratitude, who would be willing to lay down their life for their country?'; Prime Minister Nakasone also recommended the former Kamikaze pilots to young people as role models, and urged the restoration to central place in education of the Imperial Rescript on Education – a fundamental text used for indoctrination of *tennō* myths in the pre-war period. Nakasone was far from being unique, but he was the most powerful and articulate advocate of the cause of clarifying the national identity, liquidating 'the postwar', and reasserting internationally the unique virtues of 'Japaneseness'.

From 1989, the Ministry of Education ordered all schools in the country to feature the *'Hinomaru'* (flag) and the *'Kimigayo'* (anthem) in all school ceremonies, and in the funeral and succession rituals following the death of emperor Hirohito in January 1989, the state was drawn deeply into collusion in tennoist and state Shinto revanchist ceremonies (despite the clear provisions of the constitution's Article 20 forbidding it). As Carol Gluck recently observed, what is at work here is the process of incorporating the emperor at the centre of a newly evolving 'cultural nationalism', to which observation she adds the comment: 'As before in Japanese history, fundamental national issues are being played out on the contested public terrain of the emperor system, which ground is no less slippery for its being now symbolic'.

The persistence of classic pretensions of *tennōsei* in the garb of contemporary 'symbolic *tennōsei*' is noted by critical anthropologists. If *tennōsei* could be identified with the cultural and spiritual essence of 'Japaneseness' as the soul of the much-admired Japanese technological civilization, the respect and admiration of international society might be focused on it, while Japanese society could maintain its coherence and avoid the splintering and fissiparousness of other modern societies. If the process was really successful, Sakai and Yamaguchi suggest: 'if Japanese civilization theory can be fused with Japanese *tennōsei*, an omnipotent and universal *tennōsei* could become the very axis of international society'.

Although clad in democratic garb, the basic function of the imperial institution of fusing an ontological unity out of disparate elements by the process of co-option and rejection, thereby reinforcing the capacity to engage successfully other (outside) bodies, remains unchanged. In the pursuit of total monolithicity in which the 'hearts of one hundred million people beat as one' (*ichioku isshin*), dissenters and heretics are isolated and marginalized, and the reproduction of an identical mechanism of bullying, ostracization and discrimination throughout the society represses diversity and enforces standardisation. The imperial institution and family floats sublime and unchallenged over the surrounding society, protected by the combination of superstition and terror, a force powerful enough to cow even the otherwise ruthless and voracious Japanese media into the cowardice that it calls 'jishuku' or self restraint. Although in earlier days the pretensions of *tennōsei* to symbolize the whole people were limited by the technology available, contemporary technology in the modern state makes it possible to reach the minds and imaginations of all, so that there is no refuge from the 'symbol'.

The quest for an acceptable identity to present to the world in the process of *kokusaika* reached a peak in the 1980s. Prime Minister Nakasone seized upon the 60th

"...the quest for a sense of ease with itself, its region and the world, is blocked by the set of values and ideas associated with its own rise: the notion of Japan as a special land, directly founded by the gods, superior to its neighbors."

anniversary of the accession of the Showa emperor, which also happened to be the 40th anniversary of the end of the Second World War (in 1985), to articulate the aspiration to discover and proclaim to the world a distinctive Japanese identity. The group of Kyoto-based scholars who responded to his call looked back to the pre-agricultural, broad-leafed deciduous forest-dwelling, hunting and gathering Jomon society, in which they found a harmonious, ecologically sound, animistic community which impressed a distinctive and apparently permanent mould on the deep or sub-conscious mind of the subsequent peoples of the archipelago; that pattern was unique and would seem to have been most purely transmitted through the imperial institution as it was crystallized in the time of Prince Shtoku (574-622), although the deep consciousness of all 'Japanese' was shaped by it and concepts such as *'wa'* (harmony), and *'ie'* (household, as distinct from individual), were characteristic of it. For much of this prescription there are precedents in the ideas of the prewar 'Kyoto School' associated with Nishida Kitar and Watsuji Tetsur. The search for a clear vision of what it meant to be 'Japanese' in the 1980s bore striking resemblance to the 1930s drive to clarify the national polity (*kokutai meichō*).

Though the ideas of the 'New Kyoto School' were greeted with criticism and derision by scholars and independent thinkers when they were proclaimed in the mid-1980s, that soon changed. When a lavishly-funded International Research Center for Japanese Studies (in Japanese: *Kokusai Nihon Bunka Kenkyū Sentā* or *'Nichibunken'*, literally 'International Centre for Research on Japanese *Culture'*) was established in Kyoto in 1988, it drew the active involvement of many scholars. The peculiar resonance, even in its name, with the prewar Kokumin Seishin Bunka Kenkyujū, and the highly political context of its birth, was noted, and its purpose – to identify the unique quality of Japanese culture and pass it on to the rest of humanity – drew widespread criticism from independent academic organizations, but in due course its academic programs (and its budgets) disarmed the criticisms of all but a few.

The more bizarre claims – of a deep-structured Jōmon-rooted Japanese distinctiveness – were set aside, but without any such process of criticism, negation and transcendence as would inspire confidence that they had actually been rejected. Indeed it seems likely that similar assumptions still persist among Japanese elites and continue to bedevil the *kokusaika* agenda. The ghosts of the *Kokugaku* scholars, still hungry to find and neutralize the *'itsuwari'* of the 1990s and assert the uniqueness and pristine beauty of the Japanese essence, remain to be laid. Cultural *tennōsei* nationalism is *tennōsei* nonetheless.

Japan undoubtedly underwent a crisis of values following the collapse of the *kokutai* in 1945, but the process was quickly arrested. The crimes of the 1920s and 1930s were interpreted in such a way as to leave the central voodoo intact. When the US and Japanese conspirators of 1946 agreed to protect the *tennō* from prosecution and to shift criminal blame to lower echelons around the throne in order to cover-up for Hirohito, they agreed that the emperor, serving the US and Japan alike as the incarnate Japanese essence, must be sacrosanct. He was, therefore, the absent centre around which the Tokyo trials evolved. (To represent the gods before the court there was only the hapless Pu Yi – the abandoned incarnation of Amaterasu – but *his* relationship with the gods was forgotten on all sides.)

The process of critical transcendence that was interrupted early in the wake of the defeat of 1945 remains to be carried out by democratic and internationalist Japanese. The universalist civil society prescriptions of human rights, democracy and equality and intercourse continue to be suspect as part of a hegemonic Western imposition. Rejected in 1942 in the name of 'transcending modernity' (*kindai no chōkoku*), they are rejected now in the name of affirming a 'robust' autonomous 'Japaneseness'. 'Inter-nationalisation, by a perverse logic, is defined as the equivalent of 'ultra-nationalism' (*kokusaishugi* = *kokusuishugi*).

ASYMMETRY may be noted here between the responses to the world of the region's most 'advanced' and most 'backward' societies, Japan and North Korea, both insisting to the outside world on the purity and uniqueness of their essential spirit, as concentrated in the *tennō* family on the one hand and the Kim family on the other, both resisting pressures for institutional and 'cultural' change, while both experience acute difficulty in relating to their neighbours. The similarity is masked only by the contrast between the economic might of the one and the destitution of the other.

Absence and invisibility was then, and has remained, the characteristic of the centre of the Japanese ontology, an

absence noted by observers from Maruyama Masao in the 1940s to Karel van Wolferen in the 1980s. Till today, the total absence from debate on political reform is the same empty imperial tabernacle; for who would raise a republican standard in the political reform debate? Who, knowing the force of the unwritten tribal conventions, and after observing the waves of repressive force that swept over the society before the death of Hirohito, or the fate of Mayor Motoshima of Nagasaki, would challenge Japan's deepest and most invisible 'structural impediment'?

In the 1990s, as in the 1930s and 1940s, the ramifications of the challenges to the Japanese people to define who they are and what they wish to signify to the world closely concern both their Korean neighbours (and residents) and the members of social and regional minorities, especially those who nurse memories of being victims of previous Japanese quests to realize the 'true' Japaneseness: if Japan is to discover now the solution it could not in the 1930s to the problem of co-existence and co-prosperity it is they who will first know. The large internal minority of Koreans in Japanese society, together with other minorities such as the Ainu and the foreign workers from all over Asia, are at the forefront of the challenge to achieve a fully democratic civil society, open to diverse, equally relating, parallel but different communities. It is therefore ominous that distrust remains deep between South Korea and Japan, while North Korea is still an unrecognized Limbo-land, and that Koreans resident in Japan continue to be the most vocal critics of the Japanese 'system'. It is scarcely surprising that attempts to define 'Japaneseness' in chauvinistic terms of racial purity or 'natural community' hold little appeal for them.

AS in the 1930s one litmus test of Japan's *kokusaika* was Manchukuo, in the 1990s one could point to a number of test cases; Australia is at least one of them. The importance of Manchukuo to prewar and wartime Japan derived from its strategic location and its resources (including food). Now that the Cold War is over, the problem of imagining a relationship with the region (and the world) not defined either by Japanese hegemony (as in the decades to 1945) or by US hegemony (as in the Cold War) vexes Japanese minds, and although there is no direct parallel in strategic terms, in terms of resources the importance of Manchukuo in the 1930's has been paralleled since the 1960's by that of Australia. Despite the clear importance of Australia to Japan, it is ignored in most discussions of Japanese foreign policy or economic relations.

Japan's future city of the 1930s was the Northeast China city of Changchun, then at the heart of Manchukuo and known as Hsinking, or new capital. In 1987, MITI proposed to build a future city somewhere in Australia as a joint Japan-Australia project. The utopian aspiration was marked by language appropriate to an age of structural economic transformation (hi-tech and information capitalism), ecological and planetary crisis, and rise of a 'leisure society': the city of the future would be hi-tech, green, and hi-touch. This utopianism, however, was entirely fabricated and had as little relation to any actual need or desire on the Australian side as did the construction of Changchun in the 1930s (a project which ironically was itself modelled on the construction of Canberra, Australia's own future city project of that time).

UNLIKE Canberra or Changchun, it is far from clear that Australia's MFP will ever be built, but much has been learned from the way the project was bungled, and there are some indications to suggest that the Japan-Australia relationship might be occasion for pursuing a fundamentally different approach to the problems of *kokusaika* that Japan so signally failed to resolve in Manchukuo. In that sense, the relationship with Australia in the 1990's presents problems for Japan which are of broader significance than the mere bilateral relationship.

The relationship between Australia and Japan is marked by a degree of mutual affection which is unprecedented. Top Japanese business leaders build their private retreats in Australia, and political leaders take their holidays there; after all, what other country is there to which Japanese leaders can go with light hearts? Surveys in Japan commonly show Australia as the country most liked; 630,000 Japanese visited it as tourists in 1992, and the number is steadily rising. In 1992, a senior Japanese Foreign Ministry official suggested that Australia was the country with which Japan was most likely to achieve a 'partnership'.

The forces driving this are not merely economic. In strategic terms, Australia is closely linked with most of the major countries or groups important to Japan: the US, European Community, China, ASEAN, the South Pacific, etc. It neither threatens nor competes with Japan, and it is therefore possible to work together on many issues (Cambodia for one example, but in future, and if Japan developed more serious will on the issues of North-South technology and resource transfer and global environmental crisis, a common response which drew upon the idealism of both peoples might be possible).

Even more important, however, is the fact that Australia shows Japan a way out of its historic cultural

dilemma. Both Australia and Japan were once proud of their identities as monoracial states (*tan-itsu minzoku kokka*); both saw themselves as superior, racially pure, better than their Asian neighbors; 'sloughing off Asia' (*datsu-A*) for Japan was paralleled by the Australian fiction of racial purity that became known as 'white Australia' (*hakūgo shugi*).

Australia, however, through its adoption of multiculturalism as a national policy, has over the past twenty years moved to abandon its monoracial pretensions and open itself to the creation of a new identity as a multicultural state. Already its population makeup is 5 per cent 'Asian', soon to be 10 per cent. Without actually becoming 'Asian', the country is fast becoming simultaneously post-Asian and post-European, in the sense of transcending both its own original European cultural and racial hegemony and the monolithic ethnic, cultural or religious structures of some parts of the region, while choosing to be open to people of all races and beliefs.

In the growing commitment to republicanism, too, as the mature form of civil society for an independent and democratic people, Australia is pushing against the frontiers of social and political development, as it has since it pioneered the 8-hour work day at the end of the 19th century and political rights for women in the 20th. In doing so, it also presents an implicit challenge to Japan in terms of both state organization and society, and in the possibilities of radical (and profoundly liberating) change in the deep structure of 'identity'.

Where Japan moves to restore (or create) the symbols of monoculturalist tribalism – flag, anthem, shrine, myth and cult – and the fundamentals of the 'National Polity' remain as stern and bound by defences of terror and taboo, Australia is engaged in uninhibited debate over what nation it is and what it would become; it recently changed its national anthem (after wide-ranging public discussion), and the question of what to do about a flag is widely canvassed. A recent suggestion – that Australia decide to have no flag at all – probably has little support, but it forms part of the debate, and cartoonists help to focus the imagination on what is involved by engaging in uninhibited and irreverent speculation on the possibilities.

"The sword of primordial Japaneseness is, however, double-edged. It was just such 'Japaneseness' which, through creating a sense of membership and unit solidarity and fostering it through the following centuries, facilitated Japan's remarkable, if at times terrifying progress, especially in the 20th century. But it was also the tragic blemish that increasingly bedevilled the Japanese enterprise."

As the Japan-Manchukuo relationship was the litmus test of Japan's *'kokusaika'* or internationalization in the 1930's, so the Japan-Australia relationship may be seen as a litmus test in the 1990's. Australia's society, however economically backward, may be socially more developed and mature, presenting Japan a mirror through which to see its own future.

BUT Japan faces an even greater challenge. For Australia to cope with its identity crisis requires only renunciation of a sovereign who is already remote and (her heirs in particular) more than faintly ridiculous, and acceptance of an internal diversity and external complexity which few would even want to challenge and many positively enjoy; it is only necessary to state the matter thus to realize how far apart is the reality of the two societies.

To achieve its true identity, its multiple subjectivities, Japan in the 1990s faces a grand, and yet terrible choice: to renounce the mask of 'Japaneseness' as a unique, imperial essence that it has worn for over a thousand years. Historically, the dawning of the realization that that 'Japaneseness' has been an external imposition, the earliest and most successful foreign takeover, makes the future sloughing-off process imaginable – for what can be understood to have had a beginning can be expected to have also an end – and the process of *'datsu-Nichi'* or sloughing-off of the false, imposed and unnecessary identity could open the way to rediscovery of an archipelago which, like the pre-'Japanese' archipelago, was home to multiple different cultures and peoples, each engaged in exchange and co-operation with its neighbours both within the archipelago and beyond. The end of 'Japan' could open the way to the flourishing of many countries, just as the end of the many countries of Edo Japan led to the flourishing of the modern state known as 'Japan'. The contradictions that divide 'Japan' from the rest of the world would dissolve as 'Japan' itself dissolved, as the Cold war was dissolved by the dissolution of the Soviet Union. When the unnecessary and contingent nature of the creation is grasped, it will already have been transcended. ★

OPINION

Greg Clark

APEC: cornucopia or cul-de-saki?

RECENT moves by Canberra to strengthen relations with Japan are obviously welcome. But in the details of the relationship there are too many loose ends for comfort.

Australia's close involvement with APEC is a case in point. Clearly this provides a strong point of cooperation with Japan. But Australia needs to consider the pros and cons of its involvement much more seriously.

APEC is not the most logical forum for Asian cooperation. There is for example the problem of US participation. The US is caught up in a worsening trade argument with Japan. From time to time it feels a need to threaten economic sanctions against China. Partly to shore up its weakening position vis-a-vis the Asian economies, it has set up its own economic bloc, NAFTA. To be supporting NAFTA's protectionism against the outside world while actively supporting the APEC commitment to open world markets is a substantial contradiction.

Not surprisingly, some have come to prefer a more purely Asian grouping – Malaysia's East Asian Economic Caucus proposal for example. Canberra has backed determined US and half-determined Japanese efforts to frustrate the EAEC plan. But these efforts are unlikely to succeed, especially now that the ASEAN bloc has decided it wants the EAEC to survive in some form or other. It would have been better if from the start Canberra had retained a more neutral approach, and tried to identify more closely with the ASEAN group rather than Tokyo and Washington.

The same applies to APEC's would be role as a political summit forum to discuss Asian 'security'. From the start it has been clear that the main US and Japanese aim has been to find a way to keep the US strategically involved in Asia. But most of the smaller Asian powers would prefer to see some balance in big power involvement in Asia; current US and Japanese moves smack a little too strongly of efforts to establish a Tokyo/Washington axis in the area. China too has its reasons to be unhappy about APEC as the ultimate forum; its political power there is diluted by Taiwan's participation. The ASEAN powers have now made it clear that if there is to be some Asian security forum it will have to include China and Russia with voices equal to Japan and the US. Once again Canberra has found itself on the wrong side of the ASEAN fence.

APEC has its origins in a scheme dreamed up by right wing, somewhat nationalistic, circles in Japan in the early 1960's which called for a five-nation Pacific free trade grouping of industrialised nations (PAFTA) – Japan, the US, Canada, Australia and New Zealand. The aim was to provide markets for the expanding Japanese economy outside Asia. At the time the Japanese left wing was claiming Japan had to align itself more closely with China and the Soviet Union if it was to secure the resources and markets needed for economic recovery. The PAFTA backers aimed to show than Japan had another alternative.

And to some extent they were right. The Pacific Basin nations, Australia in particular, turned out to be more resource productive than anyone imagined. The US was more than happy to provide the markets needed to keep Japan out of communist clutches.

But the PAFTA scheme itself was quite unrealistic. It ignored the rest of Asia. And while it served Japan's interests admirably to have access to the markets of four advanced industrialised countries, those countries gained little in exchange. PAFTA was soon replaced by several other equally Japanese backed schemes – ASPAC, MEDSEA etc, – all designed to keep the US involved is Asia. The final stage was the push that began in the mid-seventies for a variety of Pacific Basin groupings – PBEC etc – which culminated in the APEC proposal.

True, APEC has shed much of the conservative, anti-communist bias of its predecessors; it had to if it was to include China. But it still remains something of the Japan centrism of previous schemes. Tokyo realises this problem, which is why it has gone out of its way to encourage Australia to take a lead (some Australian academics were closely involved in the previous Japanese initiatives). Even so, it is doubtful that Asian fears of an APEC Trojan Horse to allow stronger Japanese influence in Asia have been eliminated.

TO date APEC has done little direct harm to the Australian interest since it does little more than spend resources on wordy conferences and fairly meaningless training schemes. But what happens if the EAEC proposal gains more ground? Many in Japan outside the heavily pro-US and conservative Foreign Ministry like the Malaysian idea. Recent political changes in Japan suggest Tokyo could well move to a much more pro-Asian policy in the near future. Within the EAEC, Japan would also have a leading role. Australia is currently excluded.

And is APEC necessarily the economic cornucopia Canberra hopes it will be? Canberra foresees a vast Asian-Pacific market into which Australia can sell freely and spark an export-led economic recovery. But will the developing Asian nations, not to mention Japan, drop the protectionist policies that have helped their progress so much in the past just because of APEC? Australia's main APEC ally, Japan, has just forced the large minerals exporter MIM to locate a multi-million smelter in Japan to avoid tariffs which Tokyo strategically places on processed resource goods. If

Australia cannot even hope to process its minerals before export, what hope can it have for reviving its manufacturing sector via APEC?

Australia's economic problems are blamed on past protectionism and Canberra hopes that its liberalisation policies will both spur and shame the APEC nations into further liberalisation, and at the same time encourage the growth of new and more productive industries in Australia able to sell into Asia. It is a naive view, one that takes almost no account of Asian realities.

True, there was a period in the sixties when protectionism probably did Australia more harm than good. But to blame this for all Australia's problems today reminds one of the man suffering from flea bites who was hit by a speeding truck and run over by a steamroller. As he lay in hospital recovering, his doctor started beating him with sticks in the belief that his weak condition was due entirely to those now non-existent fleas.

Two things were responsible for Australia's industrial decline. The first was the speeding truck of Australian dollar over-appreciation during the minerals boom of the mid seventies, which made most manufacturing uncompetitive. Instead of trying to treat some of the injuries caused by the outrageously priced dollar (it rose to 400 yen, as compared with the mere 73 yen it commands today), Canberra saw this as a golden opportunity to get rid of some fleas by cutting tariffs and making manufacturers even less competitive.

Then came the steamroller of rising Asian productivity. This too could have been met by sensible policies, such as:

1. forced depreciation of the Australian dollar and some temporary protection for industries seen as crucial to our manufacturing future while phasing out the less productive TCF industries;

2. deliberate policies to expand resource processing, and to encourage large scale import replacement manufacturing. In particular Canberra should have forced Asian exporters to compete for the right to undertake large scale (and therefore reasonably efficient) production in a protected Australian market rather than continue to flood the Australian market with cut price imports that bankrupted crucial Australian industries and weakened the Australian industrial base.

"...will the developing Asian nations, not to mention Japan, drop the protectionist policies that have helped their progress so much in the past just because of APEC?"

Instead Canberra allowed the high interest policies that encouraged continued over-valuation of the Australian dollar, and the laissez faire, tariff-lowering policies that guaranteed the continued loss of crucial manufacturing industries. TCF industries had to be given continued protection because Australia could not afford the worsening unemployment caused by its other mistaken policies.

True, as Australia's economic plight worsens, eventually the collapsed dollar and the desperation caused by unemployment will begin to give Australia some competitive advantage in Asia. But to date those advantages have been neutralised by the progressive weakening of the industrial base as laissez faire policies have bankrupted the industries once crucial to that base. In effect every step forward has been matched by one or more steps backward. Competitiveness gained through the weakened dollar also happens to be the worst kind of protection; it means in effect an across-the-board subsidy for every import competing industry regardless of whether they deserve to be subsidised or not. Tariff protection does at least allow government to pick and choose.

At a time when Australia needs to keep open every option to guarantee its economic future, it restricts those options by joining an organisation like APEC. Worse, by pinning its hopes on an APEC Cargo Cult effect, it ignores the hard groundwork needed to break into Asian markets. While Australia has been trumpeting its special relationships with Japan, and its hopes to see a new generation of Australians selling technology goods into Japan, New Zealand has been working at the much humbler task of breaking into the protected Japanese apple market. It has succeeded, while Australian apples are still excluded. In a range of other food products New Zealand is also doing much better than Australia. Yet in terms of numbers and expense, the Australian trade and diplomatic presence in Japan far exceeds that of New Zealand.

CLEARLY there cannot be any improvement in Japan-Australia relations until Canberra upgrades its knowledge of Japan. While Austrade in recent years has improved its Japan expertise, not one of the top four positions in Australia's Tokyo Embassy at the moment is occupied by a person who can speak Japanese or has had previous Japan experience. Most of the Canberra-based academics most active in promoting APEC and other Asian cooperation schemes have never learned any Asian language.

In the US today it is inconceivable that non-Japanese speaking officials or academics could be involved closely in advising on policies towards Japan.

Australia has never had an ambassador to Japan who could speak Japanese. Meanwhile little is done to train mature people to work in Japan.

It is at these grassroots levels that Australia should be working to improve its relationships with Japan. Instead of grand plans and strategies, a much humbler and more realistic approach is needed. ★

SURVEY

Steve Utick

Grappling with a scientific culture

This article is a tableau of Japanese public opinion about science and technology as it emerges in *The Japanese Science and Technology Indicator System - An Analysis of Science and Technology Activities* published by the National Institute for Science and Technology Policy in 1991. The massive report of 450 pages covers such issues as the life sciences, energy, the information society, and knowledge about science and technology.

IN trying to grasp just what culture and technology means in a country like Japan, an outsider's mind is filled with all kinds of bizarre impressions. Robots serving sushi, workplace engineering in multinational corporations, computer dating TV shows, endless electronic gimmickry and gadgetry, multifunctionpoli, and genetically engineered seafood are just some images that float into the imagination. We all have the impression that Japanese culture has become immersed in technology, has a growing interest in science. But what do Japanese actually think about all this science and technology? How do they think it is impacting on their lives? Are they the inhabitants of another dimension or do they share some of our own concerns, hopes and fears?

We can catch a glimpse of some of the answers to these questions thanks to the work of Japan's prestigious National Institute of Science and Technology Policy. The Institute, in its own search, collated a whole gallery of opinion polls from a variety of public and private sources in an attempt to capture the Japanese public perception of science and technology. It published these in an analysis, *The Japanese Science and Technology Indicator System*, in late 1991, although the document has just become available in Australia.

The findings in these polls reveal a technologically and increasingly scientifically literate society, with a more balanced view of the positives and negatives of technological progress than might be expected. Science and technology is well represented in boardrooms rather than being confined to laboratory backrooms. Cultural differences between Japanese and nations such as Australia and the United States are to be expected. However, new concerns and shifts in opinion are emerging concerning attitudes to work and technology, to the information society, to the relationship between technological progress and spiritual and moral values, and to the relationship between humans and nature.

While the results of any individual poll must be viewed with a sceptical eye, and care should be taken in interpretation due to same sample sizes (1000 – 2000 respondents in many cases), the scope of data in the entire analysis enables the Japan watcher to piece together more pieces of the puzzle from the samples of opinions revealed.

Faith in scientific and technological progress

The Japanese are less unquestioning of the benefits of scientific and technological progress than is often assumed. For example, some 58% don't believe that "all the socio-economic problems we are facing today can be resolved by scientific and technological progress" can be even probably true. The Institute's analysis conceded that while the majority of the public had positive opinions about science and technology in general, there was "also concern about some aspects of scientific and technological progress".

Does science have its true believers?

Of those "very interested" (over 10%), males outnumber females four to one. While these responses do not necessarily imply unquestioning belief in science and technology, a positive perception usually accompanies this high interest. On the other hand, a solid majority of women (56%) remain uninterested in science and technology.

Men are also more likely to obtain information from scientific magazines and journals than women, although an overwhelming majority of both sexes (90%) cite the electronic and printed media as sources of information. Generally, the higher the level of tertiary education, the greater the interest in science and technology (and given high participation rates in Japan, this must be a significant finding).

Science in the boardroom

There is likely to be very significant support for science and technology from within the leadership of industry generally. Unlike Australia, where management boards are more likely to be dominated by lawyers and accountants, a healthy share of company directors in Japan have academic backgrounds in science and engineering. In some industries, this

applies to over 45% of such directors. Science and technology can be identified as part of and influential in the wider economic culture.

A comparison with Australia could hardly be more striking. In recent survey of the top 50 companies undertaken by the Australian Institute of Engineers, it emerged that only 2 out of 416 directors formally represented technical functions at board level!

Darwin was right!

Surveys of the recognition of major scientific hypotheses demonstrated a high (and in the case of evolution, growing) proportion of acceptance. Clearly, the evolution vs creationism debates so prominent in the United States have not had any impact on public perception in Japan, although given cultural differences, this result is not surprising. Religious concepts in Japan are appreciated more as myth and parable, rather than given "truths". Levels of acceptance for some hypotheses in physics, such as the "big bang", were lower.

Has enthusiasm waned for the "Information Society"?

Positive perceptions of convenience associated with an information society are beginning to fade slightly (dropping from 38% in 1981-82 to 35% in 1985-87), while some clearly negative ones are taking hold. While information overload remains one of the main problems here (47% recognition), issues of control, alienation, and perceptions of invasion of privacy are growing quickly in the public mind. The percentage of Japanese who think that invasions of privacy have increased jumped dramatically from 31% in 1981-82 to 48% in 1985-87, much of this linked to the spread of computers.

Whither nuclear power?

The eighties also witnessed a dramatic slide in popular support for nuclear power generation, particularly after the Chernobyl accident of April 1986, and this has never recovered. From a peak of 62% in 1979, support has plummeted to a mere 27% in 1990.

Sacred Robots?

A rather bittersweet perception picked up in the report was the shift throughout the late 1970s and 80s in the view (up now to 33%) that the "spiritual richness" of life would be lost as society became increasingly mechanised, although a larger minority still do not agree. This survey extracted from "*A Study of the Japanese National Character*", conducted by the Institute of Statistical Mathematics, was one of the most revealing in the entire series. When faced with questions dealing with general perceptions about science and technology, responses generally tended to be positive. The opposite was the case when dealing with the relationship between scientific and technological progress and spiritual and moral development.

Will employment fall thanks to robots and computers?

The perception that work "will become more interesting as science and technology advances" seems to have become less acceptable during the late eighties with general support dropping from 46.6% in 1986 to below 42% in 1990. A sizeable majority (over 55%) surveyed in 1990 believed that employment will fall due to the spread of robots and computers, as against 32% who disagreed. This is an interesting (fatalistic?) finding for a country often identified as the "robot kingdom" robotto okoku.

Technological progress and the environment

A 1990 survey conducted by the Prime Minister's Office on the relationship between technological progress and the environment, found a fairly equal division among three main views. The largest proportion (28%) felt "greatly concerned about possible environmental problems resulting from technological progress" as against the view that 'technology is so clean that there is no need to worry" (23%), and that "a certain degree of pollution cannot be helped" (21%). Higher percentages of men than women responded to the latter two. The rest responded with 'don't know'.

Hands off nature?

Further evidence of growing disquiet among women on environmental questions was revealed in the shift in public opinion on the relationship between nature and human beings. Polls also conducted by the Prime Minister's Office in December 1985 and January 1988, demonstrated a shift in opinion towards the view that nature should not be interfered with at all (now almost 36%). This was a view more likely to be accepted by women than men. While the most substantial opinion (over 45%) is still the symbiotic view that "human beings should adhere to the principles regulating nature, but at the same time use nature for the benefit of mankind", this middle ground is being squeezed. Paradoxically, the "humans controlling nature" view, while small, is also growing (up to 11%).

Science and technology aspirations

High on the wish list of Japanese public opinion were the development of alternative (non fossil) energy sources (almost 39%), development of earthquake and disaster prevention technology (35%), development of artificial organs (32.5%) and anti-pollution technologies (31.6%).

Top of the poll were however were products which assisted aged and handicapped persons (a solid 46%). Given the demands likely to be created by the ageing society in Japan, this result is quite understandable. ★

Peter Lovelock

Information technology has created a vacuum – particularly for that special sort of information called entertainment. Cable, satellite and broadcast TV, powered by a digital revolution, are going to be able to deliver rich information conduits to just about every citizen on the planet. But what will they screen?

Selling culture or selling out?

THE INFORMATION sector, including the 'entertainment industries' – film and television, advertising, newspapers, magazines and book publishing – is the fastest growing sector of the world economy today. Information technology (IT) in its narrower sense (transfer of information) is seen as the most important factor in increases in efficiency and productivity in this era of capitalism. Entertainment is America's second largest export industry (after aerospace). You weren't aware of this? The Asians are.

First let's look at the statistics, then perhaps we can deal with the lies.

A recent OECD report forecast that the Asia-Pacific will account for one-third of the world's population by 2010. By 2040, half of all global output will be made in Asia. Already one in four of the world's VCRs are manufactured by developing countries in the region. The peoples of East and Southeast Asia contain twice as many couch potatoes as Western Europe. Indeed, television ownership in Singapore, Hong Kong, Taiwan, South Korea and Malaysia has now reached saturation point, with most people owning color sets and many people owning more than one. TV penetration in the mega-cities like Manila, Bangkok, Jakarta, Beijing, Shanghai and Guangzhou is as high as their newly-industrialising neighbours.

In China alone, 200 million of China's 300 million households are thought to have television sets – with an estimated 700 million viewers throughout the empire. Sell *Hunter* or *Falcon Crest* to the Chinese, as Warner Bros did, and you get Chinese audiences of some 450 million people per week! What then to show at the ad break?

Chinese film audiences, on the other hand, are slipping. By 1988, the Chinese film industry could barely manage to sell 22,000 million theatre tickets in a year. This compared to 27,000 million at the height of the mid-80s boom. And we thought our film industry had fallen on hard times! Now, if we could just get them all to a buy a ticket to *Strictly Ballroom*... (I would suggest *Romper Stomper*, but then who wants to put ideas in their heads).

Bear with me, there's more.

Japan's movie and video market will grow twice as fast as the US market through the 1990s, doubling to ¥6.2 trillion (US$49 billion) annual business by the year 2000. Taiwan's video market is already estimated at over US$100 million per year. The *average* shop in downtown Taipei stacks 6,000 cassettes with 200 new titles issued weekly. With the demise of the Soviet Union, our northern neighbour Indonesia, now has the fourth largest television market in the world. With economic growth in excess of seven per cent per annum and their first commercial broadcaster licensed only three years ago, the Indonesians appear on the verge of a massive and rapid broadcasting boom, likened by one observer, "to the boom in the American television industry 25 years ago".

Another analyst estimates that the cable-TV market in South Korea will be worth five trillion won (US$6.5 billion) by 2000, when over 200 systems will be in operation. The hardware market will total $2 billion, software will be worth $52 million a year and advertising revenues will exceed $916 million. Already South Korea is the second largest advertising market in the Asia-Pacific, having overtaken Australia in 1993.

OK, you probably knew all this anyway, right? Why else would you be spending your insecure and depreciating dollars on as risky a venture as Australian Television International (ATVI) – the ABC's push into Asia? (See page 66.) Because of the Australia-Asia trade relation.

How does this relate to the cultural industries? Well, when people *have* focused on this argument, it has usually run thus: new technology is revolutionising the broadcast media. Cable-TV means that we will have 57 channels instead of five and that we will have to pay $5 to see *Silence of the Lambs* and eight cents to watch Andrew Denton; satellite-TV means that the letters on *60 Minutes* will come from Dhaka and Phnom Penh instead of Bellevue Hill and Lakemba; High Definition Television (HDTV) will mean that if you get stoned and watch TV the experience will feel real; interactive TV will

ILLUSTRATION IAN HAIG

mean you don't have to inhale – it is real.

The conclusion drawn is that with all of these new developments there will be a huge demand for film and television programs. In Japan, with three new satellite networks and over 47,000 local cable stations, broadcasters are struggling to fill the airwaves. The three satellites alone have increased daily airtime from 140 to 230 hours. Thus, in this 'communication revolution' viewers in some cases are *paying* to watch hours of beach scenery and aerial shots of mountains with relaxing music. In other words, there is soon to be a significant shortfall in the supply of software – the programs – for all of

"In Japan, two of the audio-visual industries – video software and motion pictures – rank second and fourth respectively in the top ten Japanese industries...Since 1988, more than half of corporate Japan's acquisitions in the United States have been in the entertainment business."

this new hardware. So let's move closer to Asia; let's sell them *Neighbours* and *Sex*.

But, why should the Asians want to fill their new broadcast channels with our programs? Because they don't have any of their own? Because they can't make any of their own? Will it take them long to work out that instead of paying Australian producers to make programs they could pay their own producers?

In contrast to Australia, the media markets throughout Asia have been emerging, expanding and maturing for some time now. As this has been happening, issues of comparative advantage are beginning to come into play. And as with the development of Hollywood earlier this century, the key to success regionally is going to be the necessary economies of scale – in other words, the development of a major regional production centre.

This race to attract business in the cultural arena has already become a compellingly competitive one and no one in this country seems aware of the levels of investment and development going on around them. Or even that there is a race.

Take Hong Kong for example. No-one is exactly sure of the size of the Hong Kong film industry. The official statistics for 1990 showed that 7000 prints of Hong Kong films were exported with a declared value of HK$100 million (US$13 million). However most observers place the real value at about 5 – 10 times higher with anywhere between 150 and 300 films a year being churned out – the third largest film industry in the world.

Well, 1997 is looming and no matter China's acceleration onto the capitalist-road, or their reassurances, the creative community in Hong Kong is worried. For the last five years or so, the dominant film industry in Southeast Asia has been looking for a home. Australia could have been that home. We have an offshore production centre on the Gold Coast – the Warner Bros theme park and studio facilities – we seek to support. We talk of export potential and production capacity. We could have moved the Hong Kong film industry lock, stock and barrel to Australia. Instead they have gone to Vancouver and Singapore. The Canadians and the Singaporeans provided passports, waived visas and offered financial incentives. A bidding war went on and the Australian bureaucracy wasn't even aware it was happening.

BUT – I hear you cry – I don't see the Canadian film industry or, for that matter, the Singaporean film industry suddenly booming. True, and the Hong Kong film industry will continue on until 1997, but if things get hairy all of the leading players have secured their passage out and the groundwork has been laid – in Vancouver and Singapore – so that production will immediately pick-up to feed the voracious Chinese diaspora. I want my MTV!

Oh, one other thing, in case you think that we obviously can't make relevant film for the Chinese. Are you aware that the fastest growing cable network in the US is the International Channel Network? A multicultural, largely-Asian, Chinese-backed station. In other words, even the Yanks are getting involved.

Australia is missing the boat. And the consequences – to postulate the dark scenario – are potentially devastating. For as the pan-European, pan-American and pan-Asian satellite and distribution systems slowly emerge, regional production centres – mini-Hollywoods if you like – will also emerge. This will necessarily divert money and resources away from all other production facilities – and these will wilt and become even more marginal than they were in their national protection hey-day.

By production services I am referring here to the capital equipment, the hardware, and skills necessary to make movies, videos and/or TV material, the software. This includes film studios, sound stages and various recording equipment; editing material, computer-generated graphics and visual software, and post-production facilities as well as the technicians to staff all of the above.

Ignoring these developments would be a surprising response from *any* country given the emotional identification with national film industries; the revenue that the entertainment industry generates; and, the absolute amounts that are being invested in the necessary hardware. The lack of attention is particularly surprising in this country given the regional developments and the race that is going-on to tie-down a supply of film and television programs and, to use the appropriate buzzwords, to become regional audiovisual hubs and acquire the necessary economies of scale.

Hong Kong is now headquarters to the first pan-Asian direct-broadcast satellite. AsiaSat, currently with five channels including the BBC and MTV Asia, serves 2.7 billion people (half the world's population) in 38 countries. Once the Wharf Cable service is up and running, it will also contain the world's largest cable franchise. Hong Kong has every intention of becoming the major centre for relaying television signals to Asian-based satellites.

In Japan two of the audiovisual industries – video software and motion pictures – rank second and fourth respectively in the top ten Japanese industries and are now primary concerns of the powerful Ministry of International, Trade and Industry

(MITI). Since 1988, more than half of corporate Japan's acquisitions in the United States have been in the entertainment business. In 1990 Japan bankrolled more than $600 million of Hollywood's production costs.

The Singapore government has invested in more than $100 million worth of infrastructure, including: a $35 million studio backlot (one of the largest in the world); a $30 million production and post-production complex with a fully computerised special effects stage; a $4 million film processing laboratory; and the Home Box Office production complex to be used for program origination and for the HBO Asia Network.

By 1992, Singapore had eleven film companies, 54 production houses and 25 sound recording studios. All this in a country of less than three million people, with one television station and no import restrictions on commercials.

The Malaysian government has established the Malaysian Movie Village housing sound stages, a video post-production centre, dubbing facilities and film processing facilities.

Thailand leads the entire Southeast Asian region in cable-TV and MMDS delivery and will launch ThaiSat in 1993. In Taiwan over 300 pay-TV companies provide thousands of subscribers with a wide range of satellite-originated programs and local demand is growing.

And, as a result of Indonesia lifting its ban on television commercials in 1989, 16 new television stations opened in 1992, prompting production houses to spring up all over the place. Because local expertise in the film production and creative areas is still relatively non-existent, the Indonesians want foreign expertise. From where? Well, over the past few years almost the entire West Australian film industry has relocated to Jakarta and Singapore.

Australia was once pre-eminent in the region in the distribution of advertising skills. That period had passed. The industries became trained and then sent us home. The advertising industry in Australia is now a shrinking industry; the multinationals have moved offshore. If you don't believe me, compare the number of advertising agency regional headquarters in Hong Kong or Singapore or even Bangkok, with the number in Australia. Where Australia was the second largest contributor in total spending on advertising in 1990 within the Asia-Pacific region (coming in after Japan), by 1994 the Australian main media expenditure will have grown by only 10 per cent, as against huge gains from South Korea (102 per cent), and China, India and Thailand (98 per cent). In 1980 Australia was the eighth largest advertising country. In 1991, it was ninth. In 1994, it will be eleventh, overtaken by South Korea and Turkey.

And the advertising industry is important because it is the same equipment used to make ads that is used to make movies; it is the advertising industry that funds television; and for the people who made *Malcolm* or *Strictly Ballroom* their livelihoods depend on advertisements – it pays the bills. As the pot of money that Australia can dip into to make ads shrinks, so too does our ability to make movies.

THE politicians and their economists talk of comparative and competitive advantage. We are now exporting production and post-production skills and services to the region. Indeed, the Australian director Michael Warr (of Grey Scale) is one of the two leading lights in the Thai production industry and the post-production house VHQ, originally Australian, now Singaporean, is the largest such facility in Southeast Asia. Once again, Australia is failing to co-ordinate, develop or exploit this competitive advantage.

With what is the beginning of a new phase in the entertainment industry, a regional focus is required to recognise and exploit regional opportunity. A regional focus will provide niche areas for various sectors – advertising, production, some media channels, education services – to survive and flourish. This approach will, however, require recognition, promotion and – in some cases – protection of industry interlinkages.

And there will need to be an Australian production industry.

We don't have one. We have a Queensland production industry. A Victorian film branch. A South Australian Film Corporation. A New South Wales film and television office. What other film-producing nations have competing provincial level structures?

Canada, the US, China and India. Where else? Outside of Canada, which has a French and English everything, the other three are the largest film producing nations on earth. They all have internal surpluses. Australia has no such surplus and is facing a diminishing pool of money. What we do still have is some of the most highly-respected talent – both technical and creative – in the world, and one of the most efficient little film industries.

And yet, there now exists the crazy situation whereby a Korean film producer thinking of spending his money in Australia will hear the Queensland hype one week and then have doubt poured on it the following week by the New South Wales film and television office as they compete for his business. He is then further confused by the Australian Film Commission one week later. What the hell? If the Australians don't even trust their facilities, let's go to Singapore. Nobody says a bad word in Singapore. (Nobody even swears in Singapore.)

This is an issue which has already arisen in other service sectors in Australia and is having to be addressed belatedly. Will our marketing of the cultural industries also follow the same tried and true path to marginalisation?

Well, what do the Asians want to

Beaming into Asia

watch? Given the logic of the argument even this may be somewhat irrelevant. With the proliferation of channels or broadcasting mediums that will slowly but surely emerge what is going to be required is not premium movies, mini-series or sporting events, but filler material. Loads and loads of old movies, talking heads, synchronised swimming and soap operas to fill up all of the new channels we are going to be zapping between.

The Asians are – or will be – looking to tie down their suppliers. Yes, they are and will be interested in purchasing *Crocodile Dundee, Beyond 2000*, the *Melbourne Cup* and some of our wildlife documentaries for good prices. But they are also very interested in buying as many programs as they can as cheaply as possible to fill out the explosion in viewing hours. This is all still novelty stuff. Being a part of Asia means tapping into a pool of money that exists regionally. We are already training their industries, it is time to take some interest in *their* culture, swap some movies and begin to reap the benefits of our efforts.

In Japan, where the explosion in air-time has already begun to happen, there are some good stories. The US Pro Am Golfers' Association, having sold more than 300 hours of tournaments in 1992 to three Japanese stations, agreed to let at least 20 Japanese players participate in tournaments even if they failed to meet normal qualifying standards simply because the Japanese stations complained that their ratings would be higher "if we have Japanese players". And, on a different note, Crazy-TV, a medium-sized production house was rung up not long ago by the Japanese equivalent of the ABC and asked to produce a loosely formatted variety show.

"How long?" asked Crazy TV

"One hour? Two hours?"

"Half a day," said NHK.

They simply needed material to block up their free time. ★

The opportunities for selling entertainment to Asia are enormous, but it doesn't mean it's easy, as the ABC may be in the process of finding out.

Well now, home entertainment was my nation's wish/ So we called up the Indonesians for a satellite dish./ On a Hong Kong phone, from a Japanese car,/ With our American voice, we shouted out into the stars./ Message came back from the Great Beyond:/ We got 57 channels and nothin' on....

Bruce Springsteen, *Changed Words*

BY NOW you are presumably all aware of the ABC's leap of faith into Asia. But have you heard the story behind why they became so culturally aware? Ex-managing director of the ABC, Malcolm Long (now with SBS), tells it rather well. How at the end of a hard day battling Vietnamese bureaucrats in Hanoi he slumped into his hotel room and switched on the TV. And the sight that made Mr Long jump waving the charter of our national broadcaster high above his head? "Lifestyles of the Rich and Famous".

What is the connection between how far they were prepared to go on "Lifestyles" and how far the ABC could go in subjugating Asia? Tacky materialism. In other words, if the doctrinaire Vietnamese are desperate enough to be filling up their airwaves with American junk culture, why can't they do it with Australian culture instead? We can make trash as well as the Americans (sometimes). And if anyone should make money out of pop culture it should be the ABC, right? Beam me up, Scotty!

However, the ABC has so far been very coy about divulging just how much money it expects to make. Of greater concern is managements refusal to divulge just *how* they will make their money. They have good reason to be coy. Let me tell you how the whole ABC proposition evolved.

A little over two years ago now, the Japanese public broadcaster, NHK, attempted to get an ambitious project up and running. It wanted to provide a regional competitor to CNN and the BBC NHK would initially be the mainstay behind the service, but it wanted to split the format up so that it would provide one-third – or eight hours – of broadcast time; another Asian broadcaster – or conglomerate of Asian services – was to provide eight hours; and it was looking for an Anglo-based service for eight hours of material. It wanted an Anglo contributor for the legitimacy that, if you like, Western news now has, and so that it would directly counter the influence of the BBC and CNN. This was to be NHK's Global News Network (GNN).

NHK went at this in a blaze of publicity and worked hard at it for well over 12 months. But in addition to fears of Japanese hegemony and the opposition of rival networks, there were questions about the viability of a regional service and a concerted push from CNN (linking up with the American movie network, HBO, and the sports-caster, ESPN). Fifteen months down the track as the GNN dream is slowly dying, Australia's ABC announces the time is ripe for the station to make its move – initially news and current affairs dominated – into the Asian market(s). At this point in time it is probably worth remembering that comedy is all about good timing.

Why, I couldn't work out, wasn't any contact made to be a service provider on Japan's GNN? Eight hours a day is more than the ABC thinks it can afford on its own now, so that

constraint wasn't the problem, and linking-up with NHK, possibly the largest broadcasting network in the world, would have provided a very comfortable financial safety net.

NHK, with more than a hint of desperation, had finally approached the American CBS network to fill their token white role. (Remember, the Japanese were doing this to *counter* the Americans, not *encourage* them.) CBS, like every other American entertainment service has been attempting to break into the Japanese market for years.

Ironically, as a result of the anti-Japanese xenophobia rife in America at the time (the Japanese had just bought another Hollywood studio), CBS was discouraged from accepting the offer. CNN thudded to earth and the mastermind behind the scheme – the head honcho at NHK – fell from grace.

Eventually I came to realise that ABC TV had simply had no idea that the *GNN-thing* was happening; that at that stage, for ABC TV, the *TV-thing* into Asia wasn't happening. So how did the ABC proposition evolve? With ABC Radio.

In fact, for the first several months or so, while ABC Radio was pushing the idea of a satellite-television service into Asia, ABC TV thought it was just about the funniest joke they had ever heard. It wasn't until the first funding proposals were taken seriously by the government that the TV people suddenly realised that there was a *good-thing* going here and they were in danger of missing it. Consequently, for about six months of last year, ABC TV was a corporation under siege with staff crisis meetings.

You used to pay eight cents for your ABC (not including GST). That has gone up slightly. The international edition, Australian TeleVision International (ATVI), is costing the government (read you) an additional $11 million. However, the ABC has been told that if the service is not self-funding within three years it will be dropped. So how do you make money from a satellite service in Asia. Well, I went to Asia and asked. The answer? You don't. At least not for quite some time.

The head of one of the largest production facilities in the region told me that he thought the ABC proposition "was a t'riffic idea".

"How will they make money?" I asked.

"Oh, presumably they'll package and sell it to a satellite service to broadcast," he ventured cheerily.

"Like the BBC do with AsiaSat?" I offered. He nodded. "No," I began to correct him, "the ABC are doing the broadcasting themselves. From Darwin. Using Indonesia's satellite, Palapa."

"Well I guess they'll run it like CNN, then..." He was a little more concerned with this prospect. "They have people who wish to advertise, I presume?"

"Yes. One." (When told that the ABC had secured *one* advertiser, a representative of AsiaSat is reputed to have fallen off his chair in tears of laughter.)

"Unfortunately, CNN is losing money hand over fist in Asia, right now," my contact mused. "How are they going to make their money?" he reiterated my question. "Are they going to beam down to cable systems for distribution, or are they going to beam straight to individual homes?"

I shrugged. "I don't know... I don't think they know."

"The ABC will at least encrypt their service, won't they?"

Not for at least a year. *Nobody* ventures into Asia and expects to make a profit in three years. Except the ABC. *Anyone* contemplating the use of satellite to offer pan-Asian services would do well to take a hard look at the history of pan-European broadcasting. At inception in 1982, satellite was seen as a pan-European vehicle par excellence but the reality has been different. Rupert Murdoch's Sky Channel lost $65 million, and in 1988, Murdoch closed down his European offices to concentrate on the English market. Europa TV, jointly owned by several pubcasters, closed down in 1986 after only one year in operation. Launched in 1987, Super Channel lost its owners more than $170 million in 18 months before being taken over the Italian Marcucci group. The Zurich-based European Business Channel went into receivership in May 1990, after just 15 months on the air.

PROGRAM providers look for a return on their investment, and the main problem for all broadcasters lies in building a secure revenue base. Nowhere in Europe, North America or Japan has satellite television succeeded without a secure distribution network. In practice that means co-operation with, or ownership of, cable-TV networks, something that doesn't exist in Asia.

There are, of course, very positive aspects to such a service – other than the perceived revenue. Despite all of the rhetoric, Australia – and Australians – are still quite an unknown quantity in Asia and our interests are viewed with a fair degree of suspicion. To be on prime-time TV night after night will at least allow Asia the familiarity to view us with a whole new contempt. It will also help to belie the myth that we would prefer to be an island in the English Channel than an island in the Pacific.

Beaming our image into Asia makes us more accessible and further breaks down barriers. It helps to build another bridge across an expanse that may be wider than we would at times care to admit. And in times of trouble and confusion, ATVI, may come to be as respected and relied upon as Radio Australia. But these are, of course, foreign policy considerations, not profit and loss accountability. Perhaps that is why it was an ABC Radio initiative. ★

Bill Weekes

Towards a new economic paradigm

Economics today is modelled on the physics of last century, and while physics has taken quantum leaps forward, economics still draws its paradigm from the mechanistic, deterministic, comfortingly certain clockwork universe of yore. Instead of regarding the world as a system of systems, as an evolving, complex organism, economists shelter from the uncertainty by trying to impose an outdated model that takes no more account of the reality of the situation than Newtonian physics takes of Einstein's relativity, and quantum mechanics. Ironically, the implications of the new physics, and the new economics, is that intuition – gut instinct – can be more important than a slide rule.

AT THE PRESENT time, the Australian economy is reeling from successive onslaughts of economic policies derived from economic rationalism, or neo-classical economics. It is obvious they are not working. In the last 20 years, we have gone from full employment to a real unemployment rate of over 20 per cent. From virtually no overseas debt twenty years ago, net external debt is now over $170 billion. The federal government is running a real annual budget deficit of between $15 and $20 billion. Between mid-1988 and the end of 1991, over 1700 Australian factories closed. This is hardly an inspiring outcome for economic policy.

Economic rationalists say that a free market will allocate scarce resources in the most efficient manner, where, for each sector, a market clearing price is established at the equilibrium point between supply and demand. At this point, consumer satisfaction will be maximised; businessmen's profits will be maximised where marginal costs equal marginal revenue; and resources will be allocated efficiently. This is based on the assumption that in conditions of perfect competition, economic man maximises his satisfaction by ordering his preferences while receiving diminishing marginal utility from the additional consumption of any particular good, producing a downward sloping demand curve; and that a firm faces diminishing returns as its volume of production increases, producing an upward sloping supply curve. (Costs and prices are on the vertical axis and sales and output on the horizontal axis.)

It is then argued that government intervention in the market should be at a minimum, as it will only promote inefficiency. Following from this, publicly owned commercial enterprises should be sold. Both the labor market and the banking system should be deregulated. Protection should be abolished and free trade embraced, which will ensure that throughout the world, resources will be allocated in the most efficient manner. The full employment of labor and other resources, and social costs, are ignored. But the problem is that the principles of economic rationalism are based on old fashioned models of the real world that were proved incorrect many years ago. In the 1860s, theoretical physics was regarded as the most prestigious of the sciences. A group of economists in Britain and Europe thought if they could model economics upon physics, it would give the discipline more credibility. The problem was, however, that at that time physics failed to describe the real world correctly.

The physical model of reality was a closed system model, where time was ignored, and where the components of the system related to each other in fixed parameters in static equilibrium, like the workings of a clock. This was the model that attracted the economists, particularly the concept of static equilibrium embodied in the law of the lever. In 1871, after writing several earlier papers on a similar theme, W.S. Jevons published *The Theory of Political Economy.* This was followed by comparable works by the Austrian Karl Menger (1871), and the Swiss economist Leon Walras in 1874. They described a model of an economic system that was purloined from physics, and was based on a theory of value where under conditions of perfect competition, utility served a similar function to that of energy in the physics paradigm. It also used the concept of marginal increments, because this enabled the differential calculus to be employed.

It accepted a closed system, static model of the universe because, in the words of Cambridge economist Joan Robinson, it was too complicated to bring into a single model both movements of the whole through time, and the detailed interaction of the parts. Moreover, the "soothing harmonies of equilibrium" supported laissez-faire ideology. These principles still form the basis of neo-classical economics today.

ILLUSTRATION: JOHN SPOONER

Not only has the physical model on which they are based since been proved inadequate, but the economists themselves attracted considerable criticism from physicists because of flaws in how they had adapted the model.

These criticisms were ignored. Moreover, the adaptation was made without ever testing its assumptions in the real world by rigorous scientific experiment. It just seemed like a good idea at the time, and it still has not been tested. There are a number of flaws in the model, any one of which would invalidate it.

THE FIRST is the assumption of perfect competition, which means there are so many buyers and sellers that the actions of any one of the them acting alone would not affect overall market outcomes. But as Joan Robinson has said (Ballogh, 1982: 40-41), such a situation does not exist in the real world, which is full of distortions, oligopolies, price fixing, subsidies, speculation and so on.

Second, Robinson challenged the assumption that individual firms operated under conditions of increasing costs of production as volume increased. The neo-classicists were writing before the advent of the mass production techniques and cost accounting developed in America by the Scientific Management movement. Any cost accountant knows that the proportion of fixed costs recovered by a unit of product goes down as the volume of output increases, and goes up as output decreases. Moreover, the Boston Consulting group has conducted research to show that in the production of industrial goods at least, each time cumulative experience is doubled, costs are reduced by between 20 and 30 per cent.

This invalidates the shape of the neo-classical supply curve, which should slope down from the left, instead of upwards as it is depicted.

The concept of "utility" can also be challenged. Jevons and his associates were writing before the upsurge in European psychology, and when this occurred, ignored it. Behavioural scientists in the management field such as Mayo, Maslow and McGregor have all shown scientifically that self actualisation, self development, creativity and recognition are the major motivating factors in personality and in determining individual preferences, not "utility".

In addition, the utility-based demand curves are drawn from the viewpoint of a consumer. If you look at them from the viewpoint of a producer, it could be argued that when demand goes up, prices go up also, as producers may feel that there will be little adverse reaction to a price increase because of the high demand. In any case, few producers can adjust prices during a season, as the neo-classical demand curve suggests, lest some classes of customers are disadvantaged. Unless costs go up significantly, producers try to avoid altering prices in the short term.

The concept of the margin – or marginal increments – is also impractical. It cannot be calculated in practice. Managers set budgets on an aggregate basis for each trading year or season, and at the same time establish the selling prices and output levels which they plan to achieve. As the marginal concept does not exist in practice, how can it exist in theory?

Last, the theory of free trade, or comparative advantage in neo-classical economics, is based on assumptions of perfect competition and full employment. It also assumes perfect and instantaneous mobility of both capital and labor between industries. None of these conditions exist in practice. It ignores inflation and balance of payments fluctuations, which, in practice, can be embarrassing unintended consequences of free trade policies.

It was thought that J.M. Keynes demolished neo-classical economics for all time when he published his *General Theory of Employment, Interest and Money* in 1936, because his central thesis was that *production creates demand*, not the other way around as economic rationalists assume. But Keynes did not live long enough to defend his ideas against the onslaughts of the neo-classicists, who perverted his theory by dragging it back into their closed system models of static equilibrium.

It is interesting that Keynes studied mathematics and philosophy at Cambridge, not economics. He was taught by two influential scholars, G.E. Moore and Alfred North Whitehead. Moore, who was also a member with Keynes of the Bloomsbury group, included a concept of holism in his philosophy of ethics.

Whitehead eventually moved to Harvard, where he published *Science and the Modern World* in 1925. He proposed the view that nature consists of nothing else but matter in motion, or a flux of purely physical energy. Nature was a structure of evolving processes. The reality was the process. The realities of nature were the events of nature. Science was becoming the study of organisms, which included the way organisms interacted. In other words, life was composed of systems of systems. Scientists now describe the world as consisting of complex relationships of evolutionary processes; a network of particles whose motions, positions and actions are governed by a group of forces whose fundamental nature is still being tested. There are both strong and weak nuclear forces, electromagnetic force, and gravity.

When Keynes was at Cambridge the Cavendish Laboratory was just up the road from Kings College, where Keynes was bursar. It was here, before the second world war, where much of the development of modern physics occurred. These new ideas were at the core of Whitehead's philosophy. England led the world in theoretical physics, and the lateral thinking it invoked, while familiar to many at Cambridge, had yet to be widely acknowledged elsewhere. It would thus be

"It is hard to understand why the economics profession has not embraced these metaphors in its quest to describe how economic systems function in the real world. The physics of the 1870s is hopelessly out of date, yet neo-classical economics still clings to it and has been unable to absorb any of the post 1870 developments."

safe to assume that Keynes, a mathematician, was aware of these developments. I believe this is evident in his work. He developed a model of an economic system which was driven by increments of new productive investment.

KEYNES considered capitalism to be an open, evolving, expanding system, not a closed one. A continuous flow of new investment was needed to maintain the full employment of resources because of the multiplier effects it generated. As managers evaluate new investment proposals by applying compound interest formulae, the critical variable in new investment decisions – other things being equal – was the rate of interest. The rate of interest had to be low enough to make new investments appear profitable and induce managers to proceed. He only referred to the need for additional fiscal measures if the rate of interest could not be lowered further and the rate of new investment was still not sufficient to reach full employment.

But Keynes' message was subverted by the neo-classical economists – particularly in America – to imply that a government could increase demand by tax policy or government spending. This kind of economic management can lead to inflation; and in many cases it did. Keynesian economics, thus misapplied, was given a bad name, and this opened the door for the return of the economic rationalists and their models based on an 1870s physics which had long been superseded.

The way that Keynes was perverted says a lot for the power of tenured academics in universities to stile new ideas. Keynes threatened a whole academic industry and the reputations of established economists, and they were not prepared to change. Probably, they did not comprehend the complexities of the new physics, which case a new light on how the real world works.

Moreover, the pattern of interconnected interactions which occur simultaneously in the real world are impossible to solve mathematically for an optimum solution. You may be able to model them to some extent as a means of aiding understanding, but you cannot derive an optimum solution. The best that can be done is to simulate the outcomes which could result from various alternative configurations of resources. But even this would require much wisdom and an understanding of the processes being modelled, so as to place the correct weightings of each component and to correctly estimate its effects on all the other variables if its values were changed.

Whitehead was also at Harvard at the same time as Mayo. Whitehead's son was one of Mayo's researchers, so it could be imagined that Mayo was familiar with Whitehead's work and was influenced by it. Later studies by other researchers all built on Mayo's work. At that time, Harvard was the cradle of systemic thinking about industry. Other influential scholars were Mary Parker Follett (from Harvard's sister institution, Radcliffe) who applied the gestalt (holistic) concept to group decision making; Chester Barnard, who identified both the formal and informal organisations that exist in a corporation; and the 1978 Nobel Laureate in economics, Herbert Simon, whose later work on decision making at Carnegie-Mellon University refuted the idea of profit maximisation.

Simon claimed that the rationality of managers is bounded by both lack of time and lack of all the information needed to make a perfect decision. Therefore managers tended to make decisions which were satisfactory, or good enough under the circumstances, rather than attempt to maximise profits. He called this activity *satisficing* (not maximising). Simon also said you cannot optimise the main objective of a system and also optimise the objectives of the sub systems of which it is comprised. The sub systems must be sub-optimised in order to optimise the objective of the system as a whole.

These scholars considered an organisation to be more than just the sum of its parts. It is the way the parts of the system are arranged, or its organisation, that provides the energy to make it a distinctive entity in its own right.

This was the main theme of General Systems Theory, developed by an Austrian biochemist who migrated to the US in the thirties, Ludwig von Bertalanffy. He had developed the concept of the open system, referred to by Keynes in his General Theory. An open system is one that transforms materials by the application of energy and information, and outputs the finished products, plus wastes, into the environment in exchange for further inputs of materials, energy and information. Inputs must exceed outputs in order to provide enough surplus, or "free" energy to offset the generation of entropy – the tendency to disorganisation and ultimate destruction of the system.

Translated into management terms, this reinforces the idea that a business must produce sufficient retained earnings in order to finance the new capital expenditure projects for the continued improvements in technology and efficiency if the firm is to evolve and grow; matching Keynes' idea that an economy is fuelled by continuous increments of investment. In turn, it leads to the conclusion that if you want full employment, you must maintain your industrial basis at a sustainable level, in order to provide opportunities for a continuing flow of new investment.

In this respect, Bertalanffy's idea of

equilibrium was not static, but a kind of metabolism, a continuous breaking down and building up of components in a continuous flow of materials, energy and information, in an evolutionary context.

BOTH Simon's and Bertalanffy's ideas are compatible with those of another Noble Laureate, Ilya Prigogine, who received the 1977 prize in chemistry for discovering that organic systems existed in a state that was far from equilibrium. The components of the system are held in a state of tension – similar in concept to Simon's idea of sub-optimisation – which enables the system to efficiently interact with its environment. When there is a disturbance in the environment, the tension between the components of the system increases, because it no longer fits its niche. This tension eventually creates enough energy for the system to jump to a new configuration which will enable it to fit its new environment. This process is called self-renewal, or autopoiesis, and is essential if evolving systems are to survive.

It is hard to understand why the economics profession has not embraced these metaphors in its quest to describe how economic systems function in the real world. The physics of the 1870s is hopelessly out of date, yet neo-classical economics still clings to it and has been unable to absorb any of the post 1870 developments.

There seems to be a clear pathway of developing knowledge about systems, emanating from the work of the theoretical physicists, particularly at Cambridge; through to the philosophy of Whitehead and the work of Bertalanffy; to Keynesian economics and on to the Harvard management scholars and finally to Simon's work in economics and management decision making. But the economics profession has disregarded it.

An exception would be the late Kenneth Boulding from the University of Colorado who formed the Society for General Systems Research at Stanford University in 1956 with Bertalanffy and two other scholars. Boulding was the first to suggest that economics should be based on metaphors from evolution, and that from this, the factors of production are not land, labor and capital, as the neo-classicists assert, but materials, energy and information. Information (or knowhow) is not only the scarcest, but the most important of them, and has the unique quality of increasing the more you use it, unlike materials and energy, which are depleted.

This again reinforces the need to maintain a sustainable industrial base, because it is to the industrial base that information is applied. If you let your industrial base run down by allowing imports to erode it, you are depleting your most precious factor of production – knowledge.

The main beneficiaries of economic rationalist concepts seem to be the international banking system and international resource companies, who have nurtured this kind of research by supporting think tanks and university departments. The international banking system holds the cash surpluses from monopoly oil profits, drug money and the trade surpluses from the awakening Asian nations, gleaned in most cases from sweated labor. If financial markets are de-regulated, money can be shifted from one country to another instantaneously and this assists in obtaining the highest profits for the banks.

International resource companies are vulnerable if their cost structures in any country rise faster than the cost structures of their customers. They want de-regulated labor markets in order to force wages down. They want free trade to provide cheap imports to keep wages – and thus also inflation – down. Unemployment is not considered. But the time is now upon us to question the usefulness of this thinking, as well as its validity. Economic rationalism must be discarded, as it is fatally flawed scientifically.

A new economics paradigm which does not conflict with the current state of the physical sciences would provide a more realistic picture of how the world works.

Economic systems should be seen as evolving networks, not clockworks. The assumptions made by neo-classical economists about free markets – that they will allocate resources most efficiently if left to function alone – have never been proved. If left to their own devices, free markets will never provide a sustainable level of resources to ensure the growth of information necessary for national survival.

ECONOMIC policies should be planned and established in the same way as strategies are developed in business corporations. This involves choosing an appropriate product, market and investment mix to produce the most satisfactory profit from the firm's productive resources under conditions of risk, ambiguity and uncertainty and in an evolving and expanding environment that is far-from-equilibrium. In this process, products, markets and new investment are cross-subsidised (sub-optimised). The same approach should be applied to an economic system.

Businessmen do not use static models to derive optimum solutions, because they cannot do it. Instead, they apply their insight and understanding of the business, gained from years of practical, hands on experience. The same kinds of understanding and judgement, from practical people rather than theorists, is needed to design national economic policies. As in business, this should be a continuous trial and error process, adjusting to changes in the environment as they occur. It is interesting to note that the US cabinet consists of people with experience from the real

world. While it may be difficult to change the Westminster system of government in Australia, a national industrial policy is needed which cross-subsidises the different sectors of the economy for the good of the nation as a whole. Only in this way will Australian ever hope to compete with the rest of the world. ★

References:

Ballogh, Thomas, *The Irrelevance of Conventional Economics*, Weidenfeld and Nicholson, London, 1982.

Boulding, K.E., *Evolutionary Economics*, Sage Publications, Beverly Hills, 1981.

Jevons, W.S., *The Theory of Political Economy*, Penguin, Baltimore, 1970, 1st. ed., 1871.

Keynes, J.M., *The General Theory of Employment, Interest and Money*, Macmillan, London, 1936.

Menger, Carl, *Principles of Economics*, New York University Press, New York, 1981, 1st ed., 1871.

Mirowski, Philip, *More Heat Than Light*, Cambridge University Press, Cambridge, 1989.

Robinson, Joan, *Economic Philosophy*, Penguin, 1974, 1st. ed., 1962.

Walras, Leon, *Elements of Pure Economics*, Kelly, New York, 1969, 1st. ed., 1874.

Whitehead, A.N., *Science and the Modern World*, Macmillan, New York, 1925.

Joanne Painter

Icon in transition to interactivity

New methods of storing and transmitting digital data, combined with new switching techniques, will to bring the 'information highway' to your front door. In the process, it wil transform the television set and give consumers unprecedented control, flexibility and variety – and instead of requiring 500 channels, you may only need one.

EVERY DAY across America, families are tuning into dozens, even hundreds of different television channels. The daily fare of cable television includes sport, music, news, movies and re-runs of old TV favourites. Yet amid a plethora of choices is a remarkable absence of variety.

Bruce Springsteen's famous lyric, "fifty-seven channels and nothing on" has become more than a couch potato's lament: it is an increasingly accurate criticism of American television.

One solution is to give people one channel, the technology to interact with their television set, and the power to determine their own programming choices.

Video on demand makes this sort of choice possible. Many American analysts believe video on demand will be a major player in the information/entertainment industry next century.

A new American technology based on less-than-real-time 'burst' transmission, it will make video-on-demand efficient and feasible. Instant Video is one of several technology innovations which will reshape television in the future.

Since first lodging patents for the burst transmission process and hardware in 1988, the American company Instant Video Technologies Inc has been awarded three US patents and another three are pending. The first Australian patent was awarded in 1992.

The revolutionary technology uses time compression to provide instant access to video programs and opens the way to a new, interactive age of television viewing. Put simply, it combines the latest compression, storage and network technologies to provide instant video on demand.

It differs from real time digital compression (which brings us pay TV and multi-channels) in two critical ways: it is less than real time and is transmitted in bursts. The instant video process also offers significant advantages over the compression techniques incorporated in the Australian broadcast legislation, which only save on bandwidth. Saving time means saving money.

Two years ago, PG Company heard about the instant video technology and began negotiating to introduce it to Australia and Asia. In 1992 Instant Video Technologies Inc granted PG Company rights to market, develop and manufacture the technology throughout Asia and Australia.

This followed an 18 month long research investigation by PG Company to determine the viability of the products and processes in the region. Instant Video Technologies Asia, a subsidiary of PG Company, was subsequently formed to target the Asian market. The small, flat structured company aims to achieve this through strategic alliances with communications providers and culturally sensitive business practices.

PG Company director Ms Elizabeth Parsons believes digital compression and video on demand will produce dramatic changes to Australian media. "We see the TV set as an icon in transition. Our theoretical work repositions the TV as a service retention unit which empowers users through expanded information choices. Instant video processes make this happen. TV has been a child in our living rooms – now it is growing up and getting smarter."

Burst transmission does not preclude the arrival of pay TV in Australia, nor its continued expansion in North America and Europe. Existing cable providers are expected to subdivide or create spin-offs – specialist channels devoted entirely to one sort of sport, game show or type of music.

Ultimately, however, multi-channels will be outmoded by interactive technology which will deliver video on demand at the touch of a button.

The first instant video product is an instant video fax machine designed for commercial use. The low cost, environmentally friendly alternative to land and air courier services is based around an analog or digital video/audio signal which is fed into a transceiver. If not already digital, the transceiver digitises, compresses the signal and sends it via satellite, cable, microwave or fibre optic telephone lines to a receiver.

Rather than send in real time, however, the compressed signal is sent down the line in a rapid burst. Hence a two hour video can be transmitted in less than 10 seconds.

When received, the digital data is

"The technology will enable viewers to select any programs they wish to see at any time, no matter when they were broadcast."

PHOTO RON ROBERTSON

Elizabeth Parsons, managing director of PG Company

stored in an on-board memory (RAM or hard disk) and decompressed for viewing or recording when needed. The decompressed version is in real time form as on a standard television or computer monitor.

MS PARSONS sees the Instant Video Fax as the precursor to a range of consumer applications. "Paper fax machines created new expectations about efficient information exchange, making postal services an option, not a necessity. The VCR and pay TV introduced programming choice. We expect the introduction of Instant Video products to parallel the introduction of VCR and fax technologies. Workplace first, then the home."

Within three to five years, television viewers will be able to select a program or film from an on-screen menu, order it and within a few seconds, sit down to enjoy it.

And it doesn't stop there. The technology will enable viewers to select any programs they wish to see at any time, no matter when they were broadcast. Hence a Neighbours fan could order a week, month or year worth of programs. You could order a video or computer version of a new book, read today's edition of the New York Times or check out next week's airline listings.

Doctors could receive video demonstrations of surgical procedures at a minute's notice. Educators and business leaders could send and receive training material and exchange large amounts of information quickly and cheaply.

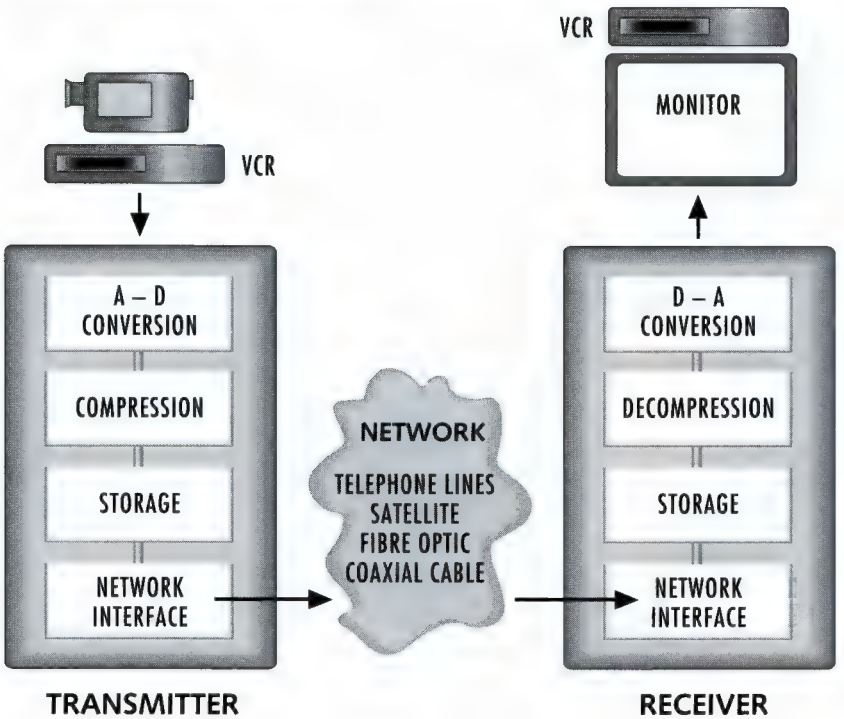
Broadcast and cable companies could send and receive days of satellite programming within minutes which could be stored, or rebroadcast. The potential savings for broadcasters alone run into the millions of dollars.

"Rather than competing with existing information systems, less than real time digital compression will become part of an 'information highway' which could reshape the way we do business, relax and entertain ourselves. When coupled with fibre optics and satellite technology, it opens to doors to a virtual communicopia."

Elizabeth Parsons believes the time when broadcasters dictated programming choices is over. "People increasingly won't accept top down broadcasting. The programmers tell us we want to watch the news at six or seven and look at a certain type of presenter. What instant video allows you is the power to choose what, when and how you watch something."

"Rather than have 500 channels, you need only one channel, your own channel and you choose what goes on that channel. If you want to watch yesterday's news you can. If you want to watch a latest movie release, you can. We see the television set as responsive, not one dimensional."

The technology which makes instant video in the home possible is



Instant Video™ process

little more than a black box which sits on top of a conventional television set. Eventually instant video capacity will be built into 'smart' television sets – computerised monitors which serve as a television, computer and interactive aid. Sending the signal is equally simple. The system works over cable, satellite, microwave and high capacity phone lines.

THERE ARE two keys to the success of instant video. The service can only work if huge central video libraries are established. These require a massive investment both in technology and hardware. To meet this need, the world's leading film studios and distributors are already preparing central film libraries for the expected video on demand market. Ms Parsons believes instant video services will lead to specialist and home video libraries. "We see families swapping everything from home videos to homework, film festivals releasing buff collections, cooking and lifestyle libraries – as well as the blockbuster services."

Then there is the issue of price. Instant Video fax sets currently cost $12,000. Production costs are also high. You need a lot of expensive silicon chips to store eight hours or more of video information, even if it is digitised.

The company hopes to bring the retail price down to $2500 in the next three years. Eventually they will sell for around $350, making them slightly more expensive than current cable converters.

Although the commercial application of instant video is some years away, a recent analysis of media trends by the American investment house Goldman Sachs, rated digital video compression "an equally important technological advance to the deployment of optical fibre... Compression technology will be applied not only to cable, but to satellite and other over-the-air broadcast transmission systems. Obviously, this offers the opportunity to dramatically expand the capacity of current transmission systems."

Driving this dramatic expansion is a confluence of technological developments, including new methods of storing digital data and new switching techniques which make it possible to bring the information highway to the front door without necessarily rewiring every home.

This is particularly relevant in Asia, where many of the NICs are spending billions of dollars installing the latest fibre optic telephone/satellite networks.

"The exciting thing is every single government in the Asia Pacific region is putting billions into communications infrastructure and it is not going into archaic technology. Their economies are leaping into the information age without having to go through the outmoded technology we are currently replacing," Ms Parsons said.

The company predicts the commercial market for instant video products will grow to $1 billion over the next 10 years. Consumer markets are expected to realise $100 billion by the end of the next decade as more countries lay the basis for the information highway.

They no doubt find it ironic that while Australia debates the merits of satellite, cable or microwave pay TV, the central assumptions in the debate are being challenged by new technology.

When pay TV finally arrives in Australia, it may quickly be eclipsed by the video on demand revolution. "This is much bigger than pay TV," Ms Parsons said. "Pay TV is no big deal. It has been around for years. We want to see Australians taking part in the global village. The question really is whether we will be left behind. If Australia doesn't introduce this technology, others will." ★

"Rather than have 500 channels, you need only one channel, your own channel, and you choose what goes on that channel."

The science of the future

Those who study futures grapple with a fascinating paradox: how may one study something that has no material existence? When people think of futures, they tend to think either of the futures market or of predictions, crystal-ball gazing. But what futures people and organisations actually do is very different. Prediction is strictly impossible in social contexts because they are too complex. You can predict the future states of any system that you can measure and model. But measuring and modelling are not sufficient for systems that include values, feelings, ideologies and so on. So how can one study social futures?

Futurists tend to begin by looking back and trying to understand the past. Next, they look around and build up an understanding of the present. They study continuities – things that will continue more-or-less as they are now. They also study change processes. (Or, rather, they skim the more specialised knowledge of many people who have detailed knowledge of change) From such sources they create pictures, trendlines and scenarios, of the near-term future. These are not predictions, so much as well developed constructs which provide useful, broad-brush views of the near future. The results are continuously up-dated and can inform decision-making in many areas of social, economic and cultural policy.

Why is such work particularly needed now? A short answer is that the world is changing rapidly and there are some extremely difficult problems which need to be solved. In this context, we need to be able to look ahead, evaluate the options open to us and then act in good time. This is sometimes called the foresight principle. When properly applied, it means that people and organisations can avoid the worst catastrophes and also act to bring about desired futures.

A number of purpose-designed organisations have sprung up around the world to address this need. Depending on how they are defined, there may be a hundred or more institutions of foresight in existence. Apart from the Institute for 21st Century Studies, we might also count the Worldwatch Institute and the Congressional Clearinghouse on the Future (Washington DC), the Institute for Social Inventions (London), the International Futures Library (Salzburg), the Network for Future Generations (Malta) and the Commission for the Future (Melbourne). They produce a wide range of research studies, reports, seminars and publications such as 21C.

The ITCS had its origins in The Global 2000 Report to the President (of the USA, Jimmy Carter) in 1980. Following publication, Gerald Barney, the director of the study, began to receive numerous enquiries from people around the world who wanted to carry out their own studies. Three years later, in 1983, the ITCS was established as an independent, non-profit corporation. The term '21st Century Study' was coined the following year.

In the following decade, the ITCS developed rapidly and played a strong catalytic role in supporting national 21st century studies in many different countries. It has offered at least three kinds of support. First, a series of publications on aspects of study methodology. Second, a number of international meetings. Third, regional training programs for study teams on four continents. These are substantial achievements.

The Institute has helped to create a valuable body of knowledge about how to carry out such a study and how to assess its significance. A series of guidelines has been derived from this work, meaning that new studies can benefit from previous

Rick Slaughter

Studying futures

The professional futures literature is an important knowledge base. The core of this literature lies in some 200 works from around the world and is complemented by journals such as Futures, Futures Research Quarterly and Future Survey. A recent issue of the journal Futures (Vol 25 No 3) looks at the core, or knowledge base of futures studies, and is an obvious starting point for serious study, as well as casual reading. Nor should we forget SF, or speculative fiction, which uses hunches, creativity and 'what if' questions to portray a vast array of likely and not-so-likely future worlds.

A number of organisations and networks cater to the needs of futures practitioners. They include the World Future Society and the World Futures Studies Federation. UNESCO and the OECD both have future-oriented programs and databases. There are also a couple of hundred 'institutions of foresight' around the world, including Australia's Commission for the Future.

Futures researchers use a wide range of methods and tools. These include: environmental scanning, scenario-building, the cross-impact matrix, Delphic surveys, forecasting, modelling and strategic management. Finally, social movements and innovations play central roles in the futures field. The former tend to work from grassroots concerns and to 'invent the future' from the ground up, as it were. The latter arise from the work of these movements, as well as from that of futurists and others. Examples of social innovations include futures workshops, quality of life indicators (to complement GNP) and, indeed, institutions of foresight.

Futures work also emerges in a wide range of practical applications. These range from strategic planning, to green politics and futures education. The futures field may appear new. However, its track record over the decades since World War II suggests that it is certainly here to stay. Taken as a whole, the field delivers a capacity for applied foresight. This is something which a rapidly changing society certainly needs. Among other things, it provides some protection against the dangers of exponential growth in a finite and fragile world.

experience. A number of broad guidelines have been developed. They include:

- studies are carried out by a team of nationals, with broad-based support and participation from a cross-section of society
- studies cover all key sectors and pay particular attention to linkages between them
- interactions between national and global concerns are encouraged, particularly as regards the economy, the environment and security
- a long-term perspective of 20 to 30 years is preferred
- studies look for strategies that are environmentally, socially and economically sustainable
- studies examine moral, philosophical and political issues and evaluate national institutions in this light
- the purposes of a study are clearly stated and carried out using a range of appropriate methodologies
- finally, careful attention is paid to implementation in order to encourage public debate, policy-formulation and practical action.

A number of general conclusions have emerged from the work of some 30 national 21st Century studies, including:

- most sectors are experiencing a rapid rate of change, suggesting that the future will be considerably different from the past
- global trends in regard to human populations, pressure on resources and damage to the environment are of central importance in defining the character of the human future
- disparities between rich and poor seem set to continue and to therefore provide many threats to a secure future
- sustainability is the key to the future, and long-term strategies and solutions are needed
- a viable future cannot be fashioned only from technical developments; major changes in human institutions are also needed.

According to Martha Garrett, Director of the European Office of the ITCS, "most of the teams doing national 21st century studies have a deep sense that the world is in a state that is unprecedented in human history. Changes are happening at a faster rate, in more parts of the world, and in more areas of life than ever before". This, basically, is why countries such as Chile, Mexico, Canada, Portugal, India, Iceland and many others are carrying out such studies. In time they will be combined into a fascinating international overview of the early 21st century.

It is surprising therefore that Australia not only has no such study in progress but, apparently, no immediate plans to develop one. This is a major oversight. Do we really think that we can walk blindly into the 21st Century? ★

Snapshot

Future Japanese infrastructure

While Japanese infrastructural investment remained high over the past decades, it was largely aimed at reducing bottlenecks that hampered industry. In the future, the main focus will be on people's living conditions, since the government feels that quality of life is not commensurate with the nation's economic power. In an effort to remedy this, a plan has been drawn up to spend Y430 trillion over 1991-2000 on 'social overhead capital'. Areas targeted include: transport and communication networks; municipal services and facilities; and environmental protection.

Source: OECD Future Studies Information Base Highlights, Number 4, January 1993

NEXT

Alistair Mant

Looking under the leadership mantle

The following article is adapted from the Australian edition of Alistair Mant's illuminating book, *Leaders we Deserve.* Mant is an internationally renowned authority on leadership and management. An expatriate and an associate of the Australian Commission for the Future, he is well placed to pose the question: what is the way forward for leaders and managers in these turbulent times?

The image of political leaders as puppets dangling on strings manipulated by others, is a frightening one for many people. In fantasy, leaders are the people who pull the strings; who know what to do next. But, in truth, the puppet image is quite realistic, whether we deal with satisfactory or unsatisfactory leaders. In the first case, satisfactory leaders in our kind of society are bound to reaffirm their legitimacy on a regular basis, either via the ballot box or, on a homelier scale, by simply checking what the people want and need. As the 18th century French revolutionary leader remarked, interrupting his cup of coffee in a restaurant and dashing into the street: "There goes the mob! I am their leader I must follow them!". Tyrannical leaders really are puppets, despite the controlling regimes they depend on. Without exception, tyrants like Saddam Hussein and Pol Pot are damaged people, deeply in thrall to their own personal demons. That goes for petty tyrants too, in everyday offices.

Political analysts were quick to assess the European leadership vacuum over the Nazification of Serbia in 1992 and 1993. Here was a modern European state, a familiar holiday destination for the middle classes of other countries, suddenly transported back fifty years to the obscenity of "ethnic cleansing", under deranged tyrannical leadership, and a day's march from Auschwitz. Why, given the daily transmission of TV images, the leadership vacuum? The answer appears to be simple and contains a valuable lesson for modern democracy. World leaders didn't move immediately against the Serbs because they could see themselves getting inextricably drawn into an expensive and unresolvable mess. This was because they were not, yet, under irresistible moral pressure from their own people. As the political analyst Hugo Young puts it: "In the world of TV images, leaders and led are co-conspirators!"

Access to public media is the new pressure point for expression of public passion or outrage. Keeping those

"It is usually what you have to do in order to get to the top that renders you unfit for high office"

channels relatively open and unbiased is one of the best safeguards we have for true democracy. The constituent's letter to his or her member of parliament is still the bedrock of democracy but collective anger or a sense of injustice needs quick expression and transmission, if not through the media, on the streets. This is our best way of ensuring that we can lead our leaders in the direction of long-term justice, as well as short-term political expediency. East Timor and trade relations with Indonesia must be the closest equivalent facing both leaders and led (in silent "conspiracy") in Australia. One of the advantages of a big and relatively empty country is that people can stay busy and in touch with other citizens through radio. Conversations on the radio are generally deeper, more thoughtful, more philosophical, and more strategic than the TV 'sound bite'.

Any book about leadership is therefore about following too. It can be argued that the most satisfactory definition of a 'leader' is a person who succeeds in triggering the powerful following response programmed into us all by our prehistory. That response was necessary for survival when the main danger came from sabre-toothed tigers. Nowadays, the following instinct remains with us but we tend to attach it to some crazy causes and crazy leaders. This isn't, therefore, a book about how to learn the tricks of "leadership". It is a reflection on some pretty powerful underlying forces which can govern our lives unless we understand and take control of them. If the book is useful, it will make the reader think afresh about familiar scenes from life and work.

Mant on the Prime Minister, Mr Keating

ILLUSTRATION: SCOTT LACEY

"I detect in Mr Keating a capacity to take a little extra pace backwards. It seems to me, in terms of personality, he is drawn into the binary all the time – that's a natural leaning, but he's got a ternary corner all right, he can take a pace backwards.

I think he could, if he was smart, turn himself into a statesman and there would be no stopping him. He would be unassailable. I remember the happy days in Germany when you had Willie Brandt and Helmut Schmidt in succession. The country surged ahead because, in quick succession, you had two of the highest capacity politicians Europe had ever seen and the whole country expanded in that arc of capacity and most of the programs that Brandt and Schmidt were putting in were 20/30 year programs. They really were looking to the future. I think, I don't know if (Keating) will, but he could. I bet he could become like a Brandt or a Schmidt – who knows whether it may happen. Other bad habits may drag him back. That's without any evidence at all, just listening to the tapes and reading, in particular reading transcripts of what he says. He puts language together really in an intelligent way."

Extracted from a parliamentary briefing given by Alistair Mant in Canberra in May this year.

Leaders We Deserve began life as an analysis of ways of thinking, and two ways in particular. One I dubbed the "binary" mode, in which the leader is driven, despite himself, by the need to prevail over, and to avoid domination by, other people. This need, it seems, is caused mostly by harsh childhood circumstances and/or inadequate parenting. It is a very common need amongst those who rise, by dint of relentless ambition, to the top echelons of organisations, including political parties. The great French essayist Jean de la Bruyere expressed the idea well in his satirical *Caracteres*: "Men fall from great fortune because of the same shortcomings that led to their rise!" To put it another way, it is usually what you have to do in order to get to the top that renders you unfit for high office. The binary mode is extremely valuable, indeed necessary, when you really are under attack. The problem with some successful people is that they always feel under attack, whatever is really going on. Some of them are downright dangerous.

The other, contrasted mode of thought I dubbed the 'ternary'. People who prefer to operate in this way always hold in mind a 'third corner' rationale for any act. The third corner gives higher-order meaning to binary relationships between people. This means that they are impelled to ask the key question: 'what's it for?' about any system or situation or relationship they are concerned with. By contrast, the binary is stuck with the implicit simple-minded question: 'will I win/lose?' The most important thing about ternary thought is that it is almost invariably more intelligent than binary thinking because it demands constant reference to the higher-order rationale (the third corner). Ternary folk are therefore wiser, by definition, but they also need to be good at fighting those dangerous people stuck, like a gramophone record, in the binary groove. Both modes, binary and ternary, are part of life – the trick, as in sport, is to get the timing right.

Anyone watching the run-up to the 1993 Australian general election could be forgiven for seeing it as a simple bar-room brawl between two binary bruisers. The level of debate was not exactly exalted and it is clear that many citizens despaired of any form of intelligent analysis of big, long term themes. Yet Australia is a clever country, both in the sense of native wit and formal intellectual attainment. The problem, as with every competing nation in the last years of the 20th century, is to mobilise that latent intelligence effectively. That will mean grappling with a number of awkward truths.

The latent capacity of the human brain is grossly underused by most people in

"Of all the disqualifiers for successful leadership, intelligence is the principal culprit"

all societies. Schools are the potential miners of this latent wealth on behalf of society. We have to reinvent schools completely. The countries which invent 'superschools' first will gain a huge and unfair advantage over those which are slow to change. Australia could easily show the world how to do it, provided it applies the right talents and insights to the task. But it calls for long term vision – making an investment which is unlikely to pay off within 10-15 years.

Although we waste most human intellectual capacity, it also appears to be the case that the very highest levels of capacity are rare. Very high capacity depends upon an unusual genetic endowment combined with precocious and sustained lifelong development. No country can afford to waste this high capacity but those individuals who possess it are generally difficult people to fit into conventional bureaucracies or career systems – let alone conventional schools, especially if they come from underprivileged backgrounds. This difficulty is exacerbated by a general reluctance to recognise the existence of very high capacity, either as a result of uncomprehending ignorance or comprehending envy – the so-called "tall poppy" syndrome. Egalitarian societies like Australia may find this especially difficult.

Intelligence is the most important, but not the only, component of high capacity, though we are generally very confused about the nature of intelligence, a confusion amplified by formal education. Most of us have met extremely silly Ph.Ds and brilliant (but maybe illiterate) artisan workers. There is a desperate need to approach the whole subject afresh so we can pick winners.

There are extraordinary differences between those people with a natural gift for character and capacity assessment and those other people, many of them highly-educated, with the contrasted gift of always getting it wrong. In his wonderful book: *The Art of Judgement – A Study of Policy Making*, Sir Geoffrey Vickers wrote: "Selection boards... attach sometimes overriding importance to the capacity of rival candidates for 'good judgement'; yet their estimation of this is a matter for their own judgement and if they differ and fail to reach agreement by discussion, there is no means by which any of their judgements can be proved right or wrong – even, I shall suggest, after the event. Judgement, it seems, is an ultimate category, which can only be approved or condemned by a further exercise of the same ability."

Effective leaders need a number of capabilities but they absolutely have to be right quite a lot of the time. That means, in turn, having the ability to think through the complex, long-term implications of the decisions they make, and having a simultaneous appetite for the burdens of responsibility which may accompany them. There is now a lot of evidence to suggest that this capacity to intuit the future is discernible at fairly young ages and its incremental development can be accelerated by well-thought out training and placing.

Since *Leaders we Deserve* was first published, it has been necessary, at each reprinting, to change the names of some of the deposed tyrants, but the underlying themes seem, if anything, to be more true as time passes. People are concerned about leadership in general and disappointed with particular high office holders. Since my argument is that there is an innate element to effective leadership, it made sense to begin at the beginning (in the womb) and take the story forward from there. Some of it makes pretty depressing reading but we need to descend into the slough of despond before we can begin to build more sensible ways of choosing and nurturing the leaders we really do deserve. The stress here is on basic capability, rather than the magical or charismatic properties that are supposed to attach to "great" leaders. My view, based on years of leader-watching, is that charisma is a psychological projection from followers, grateful, after the event, for a modicum of good judgement and decisiveness on the part of those appointed to high office. Many of the greatest leaders are fundamentally unprepossessing people who accrete "presence" via a combination of personal competence and confidence, mixed with a dose of gratitude from others. Seen thus, "leadership" is just one of the attributes of a capable manager.

Leaders we Deserve also deals with culture, with particular reference to global business. Australia is already a major player in Pacific Basin marketplaces. The Australian business inheritance comes mainly from the USA and the UK. I argue that some aspects of the European heritage might be more useful for Australia, particularly the Scandinavian and German, because they represent an approximate half-way house between the crude rugby-scrum mores of UK/USA business and the subtle ju-jitsu wiles of the East. Here is where the 'feminine', in its broadest sense, has to come into play, if Australian business is to integrate successfully with the Asian marketplace. Of course, this will also involve much more intensive use of female talent.

The degradation of our planet, in common with all other big blunders, is both wicked and stupid. The stupidity aspects of leadership is a much more practical and therefore intelligent target than the moral vacuum of our societies. I don't know how to take aim at a moral vacuum, but I have learned a thing or two over the years about tackling amoral, ambition-obsessed, narrow-minded power merchants in high office.

Of all the disqualifiers for successful leadership, intelligence is the principal culprit. I have come to this conclusion as a result of specialising, to some extent, in the arcane and goulish subject of blunders. I say goulish because much of my research and consultancy work in recent years has been concerned with transportation systems. This is a field where mistakes often cost lives. It is also a field where events are dominated by operations and operations folk, never by the theoretical interests of 'human resources' professionals. This means that outside interventions have to make sense; not much is taken, quite rightly, on trust.

Republic or divided public

But blunders are not confined to transportation. A number of governments and global banks, for example, would pick up medals in any Blunder Olympics staged in the last few years. Blunders have the advantage of concentrating the mind, especially for those people who end up in gaol for incompetence or fraud. Invariably, there is a person or group of people behaving stupidly, in ways understood and foreseen by lots of other people, commonly in subordinate positions. Bad luck is rarely the prime cause of big blunders. They are mainly caused by people who are beyond their capacities. Such people, without knowing it, tend to shrink their areas of operation to fit their personal ability to handle complexity and to shoulder burdens of accountability. The result is always disastrous.

There are other factors in executive failure. Some people fail because they lack important information, some fail because their innate skills are no longer appropriate to new tasks, some fail for want of motivation, because their personal values are out of kilter with organisational aims, and some fail because deep-seated psychological quirks (built-in since childhood) emerge explosively under heightened pressure. All of these are important and require the most careful sleuthing on the part of top management and human resources experts.

But the real killer (literally in transportation) is intelligence or, to return to Sir Geoffrey Vickers, the capacity for judgement. As he pointed out, it takes one to know one; only those blessed with judgement can reliably assess the human capacity for judgement. Australia seems to me to be an exceptionally clever country, deeply suspicious of cleverness. That is obviously problematic for the future, unless the whole subject can be opened up for analysis and discussion. I refer the reader to Paul Willis' delinquent youths, the 'lads', quoted in his book *Learning to Labour or How Working Class Kids Get Working Class Jobs:* "I thought we were the artists of the school, because of the things we did...and we were definitely the leaders of the school...Something should have been done with us, I mean there was so much talent there that it was all fuckin' wasted. I mean X, he was thick as pigshit really, but if someone had took him and tutored him...he'd got so much imagination!"

I am on the side of the lads. The clue lies in those who are simultaneously 'thick' – i.e. uneducated, and imaginative. Cleverness is not the exclusive preserve of the 'clever dicks'; in fact, they are the principal culprits when it comes to big blunders because they are always complacent. The whole nation needs to re-examine the whole subject of intelligence, in order to free up the resources which must lie hidden. That will mean freeing up the reserves of 'intuitive' wisdom locked up in the feminine aspect of society, and in the women. ★

Footnote:

***Leaders we Deserve* is available from Commission for the Future @ $29.95 plus postage and packing of $2.50 per item. Send payment to Australian Commission for the Future Ltd, PO Box 1612M, Melbourne 3001, or call (03) 663 3281 for further information.**

A century ago, fear of isolation and concern about external threats persuaded six Australian colonies, reluctantly, to join in a Federation. This continent-wide aspiration sought nationhood within the British Empire, linked by the Queen, a promise of protection from the Royal Navy, White Australia and (to a degree) tariff protection. Griffith, Deakin, Isaacs, Kingston, Barton, Symon and other founding fathers had some vision, but they recognised that there were practical limits to how far they could go. Australia had a small, scattered population in a huge continent, with poor communications.

The white population was overwhelmingly English speaking and nominally Christian. Many citizens had been born in Britain and may have seen themselves as mere transients here. The Constitution of 1901 was a compromise document which needed to satisfy the needs of six colonies. The British Government also retained the right of veto on Commonwealth (and State) legislation.

A century later, in the 1990s, there is a comparable mood towards national redefinition, with the beginning of the next century (also the beginning of a new millenium) as a psychological target. White Australia and tariff protection are both gone. The British Empire no longer exists. The United Kingdom is increasingly integrated into the European Community both politically and economically. The relevance of the British connection is coming under challenge. Britain is no longer a major trading partner (although still a significant investor here) and the Royal Navy no longer guards our shores.

Our Constitution provides for a classic 'top-down' system of rule – in fact the monarchical ('L'etat c'est moi') model, modified somewhat by the legislature's power over the Budget.

Among the subjects not referred to in our Constitution are:

- The office, function and responsibilities of the Prime Minister
- The Cabinet (the Executive Council is by no means synonymous)
- The concept of the party system, the political mandate for government and what happens after elections
- Democratic practice
- What happens if a Censure motion is carried in the House of Representatives
- The power of the House of Representatives to determine (by majority) which party shall rule.

The Constitution preserves some relics of the past, notably the royal veto on legislation (s.59). Even after laws are assented to by the Governor-General, the Queen still has the right of veto for a year.

It is worth pointing out that in the United Kingdom the last sovereign to veto legislation was Queen Anne in 1707, so it may not seem like

a current problem. However, when the Australia Act was carried by the Australian and British Parliaments in 1986, and went some distance towards repatriating our Constitution, while the Queen's power to veto state legislation was abolished, her power over Commonwealth legislation remained because it would have required passage of a Referendum to remove it.

The Constitution also assumes that the Senate is essentially a states' house, something that never happened in practice.

Judging from Letters to the Editor, objections against making Australia a republic fall into five categories:

i. 'Expense: it would cost too much.' Some estimates by correspondents say billions of dollars, others hundreds of millions. For what? The only costs I can think of would be letterheads and brass plates – and if we retained the name Commonwealth of Australia, as I would hope, the cost would be even more modest.

ii. 'We'd muck it up.' I find this argument exasperating because it suggests that Australians lack political capacity or judgment. The coded language is that we would not be able to evolve an appropriate model for ourselves. In fact we have evolved a reasonably satisfactory de facto republic; we ought to make it an honest de jure model. Our system is essentially a hybrid, neither one thing or the other.

iii. 'Other republics have been dictatorships.' Yes, and monarchies too. The broad nature of government depends on the nature of society. We have a society which is humane, democratic and pluralist and our Constitution, whether monarchical, republican or hybrid, would reflect these values.

"The Constitutional monarchy invoked by its supporters is not a reality, but an abstraction, neither functional nor ornamental: a historical model which was outdated even in 1901...and has become increasingly irrelevant ever since – an absentee monarch who holds all power in theory but in practice is no more than a photograph on the wall."

iv. 'Not yet.' Why give republicanism a guernsey when other vital issues should be dealt with first? This is the Augustinian approach ('Lord, make me chaste, but not yet!'). This is related to the 'smokescreen' argument – that Governments raise side issues cynically in order to disguise failures in other areas such as unemployment and economic growth. If this is the aim it has been singularly unsuccessful.

v. 'The revenge of the Irish.' Most Commonwealth countries are now republics and this idea takes the Irish conspiracy theory to absurd lengths!

On paper we have an all-powerful Governor-General and no Prime Minister at all. It will not suffice merely to change the title from Governor-General to President and the letterhead at Yarralumla if Chapter II remains as it is. The Head of State's powers would need to be scaled down to something like the role as exercised by Zelman Cowen, Ninian Stephen and Bill Hayden.

The role of the President and Prime Minister must be complementary and not competitive. The President should be a national unifying symbol, representing the forces of convergence and consensus. The Prime Minister, as the wielder of power and the winner of a national election is inevitably a partisan figure, to be replaced when he loses his majority, and the initiator of controversial policies.

I adopt, with some reservations, the 'minimalist' position. At this stage I would confine Constitutional change to changing Chapter II, to converting the Governor-General's role to that of a President elected by a qualified majority of both Houses of the Commonwealth Parliament, ensuring that only a consensus candidate was elected, supported by Government and Opposition, and to insert a reference to the current practice of responsible, Westminster government with a Prime Minister and Cabinet exactly as it operates now.

I believe the accusation that the republican cause is essentially anti-British is quite wrong but the subject needs to be handled sensitively – more than it has so far. Reassurances need to be given, especially to communities with large numbers of British migrants.

The Opposition can kill off the republican debate but that result would not be a victory for constitutional monarchy, but for stalemate.

The Constitutional monarchy invoked by its supporters is not a reality, but an abstraction, neither functional nor ornamental: a historical model which was outdated even in 1901 because it was never implemented as set out in the Constitution and has become increasingly irrelevant ever since – an absentee monarch who holds all power in theory but in practice is no more than a photograph on the wall.

Not even its strongest supporters propose the revival of Constitutional monarchy as a working model, with an all-powerful Queen and all executive power in the Governor-General's hands.

The 1901 model is beyond recovery. 'God Save the Queen' went, together with Imperial honours, Imperial weights and measures and Imperial preference in trade. But we must remember that the 1901 model of Constitutional monarchy was abandoned in practice far earlier. It is not hard to imagine a 'worst-case scenario' where in a Referendum the republican cause wins an overwhelming majority in the three most populous states and loses narrowly in the three smaller states. Result: a technical victory for the 'No' case, but hardly a triumph for Constitutional monarchy which had been rejected by most voters.

If that happened, we would have had a stalemate: paralysis and deep division between those looking back to an obsolete historical model and those looking forward to redefining Australia for the 21st Century.

Opponents of a republic must think very seriously as to whether it really prefers the paralysis model. ★

The end of physics?

Dreams of a Final Theory

Steven Weinberg

Pantheon Books $25.00

The God Particle: If the Universe is the Answer, What is the Question?

Leon Lederman with Dick Teresi

Houghton Mifflin $24.95

With the approach of the third millenium there has been a growing interest in the notion that physics, the original science, might be approaching some sort of completion. Enthusiasm for this vision comes mainly from the particle physics community, and is based on the idea that there exists an intelligible mathematical scheme which would faithfully describe all the forces of nature and the properties of all subatomic particles, in a coherent and unified way.

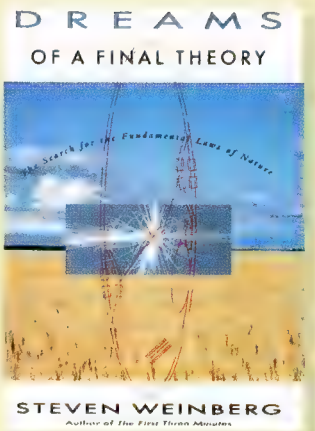
Ever since Newton uncovered the law of gravitation, physicists have been motivated by the belief that beneath the surface complexity of nature there lies hidden a simple and elegant mathematical order. This order is manifested most strikingly in the atomic and subatomic realms, where exotic fragments of matter conform to a set of interlocking abstract rules. On careful investigation, it turns out that these rules are not just an arbitrary collection, but are suggestive of deeper linkages.

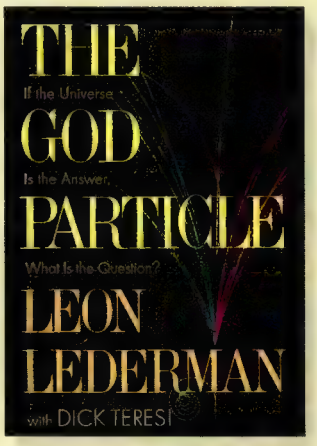
Steven Weinberg discovered one such linkage in 1967, by melding two of nature's fundamental forces – electromagnetism and the weak nuclear force – into a single mathematical description, an achievement for which he shared a Nobel prize. Since then, physicists have pursued the dream of complete unification, in which the remaining forces of nature – gravitation and the strong nuclear force – would be incorporated into the scheme. It is this unification of forces that Weinberg refers to as a 'final theory'.

In what sense would it be final? Nobody supposes that such a theory, formulated in the context of subatomic processes, would be much help in explaining, say, fluid turbulence or the pattern of a snowflake, still less in illuminating the mysteries of life and consciousness. So a final theory would not mean the end of science. The significance of this putative theory lies in the promise that it will be the culmination of the so-called reductionist program started in Ancient Greece two and a half millennia ago.

The Greek Atomists Leucippus and Democritus considered that the richness and diversity of physical systems might be attributed solely to the arrangements and rearrangements of their constituent atoms. In the modern era, the search for the ultimate building blocks of matter has focused on the subatomic particles, bearing quixotic names like quarks and leptons. The belief is that on some sufficiently small scale, matter is constructed from a handful of basic, indecomposable entities subject to simple forces.

There is no doubt that the search for this basic level of reality has been an exhilarating and spectacular adventure. Conducted mainly with huge and expensive particle accelerator machines, the exploration of the microcosmos is currently one of the most glamourous and fruitful fields of scientific research. Furthermore, the insights





gained have found valuable spin-off in cosmology. The big bang in which the universe originated can be regarded as a gigantic natural particle physics experiment.

But this very success has provoked something of a backlash. Reductionism may be a fruitful methodology, but it is a bleak philosophy. The consequences of what Arthur Koestler derided as 'the fallacy of nothing-buttery' are unattractive. If the world is nothing but a collection of inert atoms interacting through blind and purposeless forces, what happens to the rich beneficence of Mother Nature, to human freewill, to the meaning of life?

Weinberg achieved a certain notoriety by ending a previous book *The First Three Minutes*, with the chilling phrase 'the more the universe seems comprehensible, the more it seems pointless'. In *Dreams of a Final Theory* he continues to defend reductionism robustly, sometimes wildly ('We understand why the weather works the way it does.' Do we?). But the tone is not triumphalist, more apologetic. There is simply no room, he claims with only two cheers, for the 'softer' side of nature in a fundamental theory. In science, the arrows of explanation 'always point downward' toward the bottom level of reality – the particles and forces of the microcosmos. Weinberg himself may find inspiration in the austere beauty of a universe reduced to stark formulas, but many of his readers will be repelled.

The arguments deployed in defence of reductionism are largely of a well-worn 'promissory' nature: if only we were clever enough we could surely demonstrate how the migratory habits of birds are explained entirely by DNA, which is explained entirely by the laws of chemistry, which in turn is explained entirely by quantum physics...Weinberg grudgingly accepts the possibility of additional laws to govern complex systems, but denies their fundamental status. I have to say that, personally, I am not persuaded by his reasoning. I accept that the laws of physics are more *comprehensive* than, say, Mendel's laws of genetics, but that is not the same as saying they are more fundamental.

The author does not present these deliberations merely for philosophical recreation. The scientific community in the United States is rent by a highly political battle over funding for the world's

largest particle accelerator, the so-called Superconducting Super-Collider (SSC). If it is built, the SSC will undoubtedly contribute vital clues in the quest for a final theory. But many opponents of the SSC contest reductionism, arguing that particle physics has no claim to be more fundamental, and hence intrinsically more worthy, than other scientific endeavours. This book is clearly part of the propaganda war.

In my opinion the entire SSC debate is misguided. You don't have to be an uncompromising reductionist to see that the reductionist program of research is nevertheless a key component in our attempts to understand nature. It may not yield the whole truth, but it will certainly capture an important part of it.

The value of Weinberg's book lies less in perpetuating this wrangle, more in the boldness with which the author spells out the physicists' world view. Whatever physicists may believe about the appropriateness of seeking a final theory, few doubt that there really does exist a deep mathematical order in nature. This has led to a curious inversion in the physicists' conception of reality. Most people see reality in the material objects that surround them. To the physicist, ultimate reality is vested in the abstract underlying laws and their associated mathematical machinery, such as the quantum wave function.

The articulation of this conception has produced an hysterical anti-science reaction, especially in Britain where Stephen Hawking's remarks about physicists 'glimpsing the mind of God' have provoked hateful rantings by prominent commentators. Many scientists, and most philosophers, insist that the laws of physics are merely manmade inventions, 'descriptive' rather than 'prescriptive'. There are no laws 'out there' at all, they claim. So how can reality be founded on them?

"Whatever physicists may believe about the appropriateness of seeking a final theory, few doubt that there really does exist a deep mathematical order in nature."

Weinberg lambasts this sort of sophistry in language that makes no bones about his distaste for philosophy in general and positivism in particular. Try convincing a physicist that the laws of physics are merely a linguistic or methodological convenience! The practising physicist is in no doubt that she or he is uncovering an already-existing lawlike order in nature. The laws are read *out* of nature, not into nature. Weinberg is explicit about what he terms this 'rough-and-ready realism'. We physicists, he writes, have 'a belief in the objective reality of the ingredients of our scientific theories...a powerful impression that the laws of physics have an existence of their own'. He concedes that physicists might not be able to state in philosophically acceptable terms just what it is that they are doing, but sure as hell they are doing something right.

All this is a wonderful blast of fresh air. It has become fashionable to assert that science amounts to little more than just another cultural activity, and that it is successful merely on its own terms. This is nonsense. Science is a path to truth, the most reliable one we know.

Weinberg rejects any hint of purpose, design, or God, in the majestic scheme he celebrates. Among his scientific colleagues, he claims, such beliefs are non-existent. This is curious. Although I am not conventionally religious myself, I have found that many of my physicist colleagues are. But this very fact confirms Weinberg's point: science is a reliable path to truth precisely because it transcends such personal beliefs.

The existence or nonexistence of God fits very naturally into a discussion of ultimate physical theories. However, Leon Lederman's reference to God in the title of his book is pure hyperbole. Although Lederman covers much of the same ground as Weinberg, his treatment is far more superficial and journalistic. The physics is explained in a jokey-folksy style, interspersed with personal anecdotes from the author's research career and his time as Director of the accelerator facility known as Fermilab. This may make the account more appealing to the general public, but in my opinion it serves to devalue the importance and profundity of the subject.

Lederman's discussion focuses less on the inspiring coherence and unity of nature as revealed by particle physics, and more on the search for a specific subatomic entity – the 'God' particle – that could play an important role in determining the properties of the fundamental forces.

The drive toward unity in the microcosmos comes chiefly from the existence of various abstract mathematical symmetries that lie hidden among the raw data of particle processes. Some of these symmetries are masked from us because they are broken in the actual states we observe, although they may still exist in the underlying forces. A key component in the theory of unification is a mechanism that explains how certain important symmetries are broken. This is known as the Higgs mechanism after the Edinburgh physicist Peter Higgs.

If nature actually employs the Higgs mechanism to break its subatomic symmetries then there will exist associated particles – Higgs particles – of a distinctive nature. To test our ideas of unification it is crucial to discover and measure the properties of these Higgs particles. The lightest Higgs is likely to be too heavy to be created in existing particle accelerators, and one of the main motivations for building the more energetic SSC is to try and produce it.

For Lederman, the Higgs particle has become something of a holy grail of physics. However, important though its discovery would be, it must be stressed that the Higgs mechanism would constitute only one part in a mosaic of processes that govern the subatomic realm. ★

Snapshot

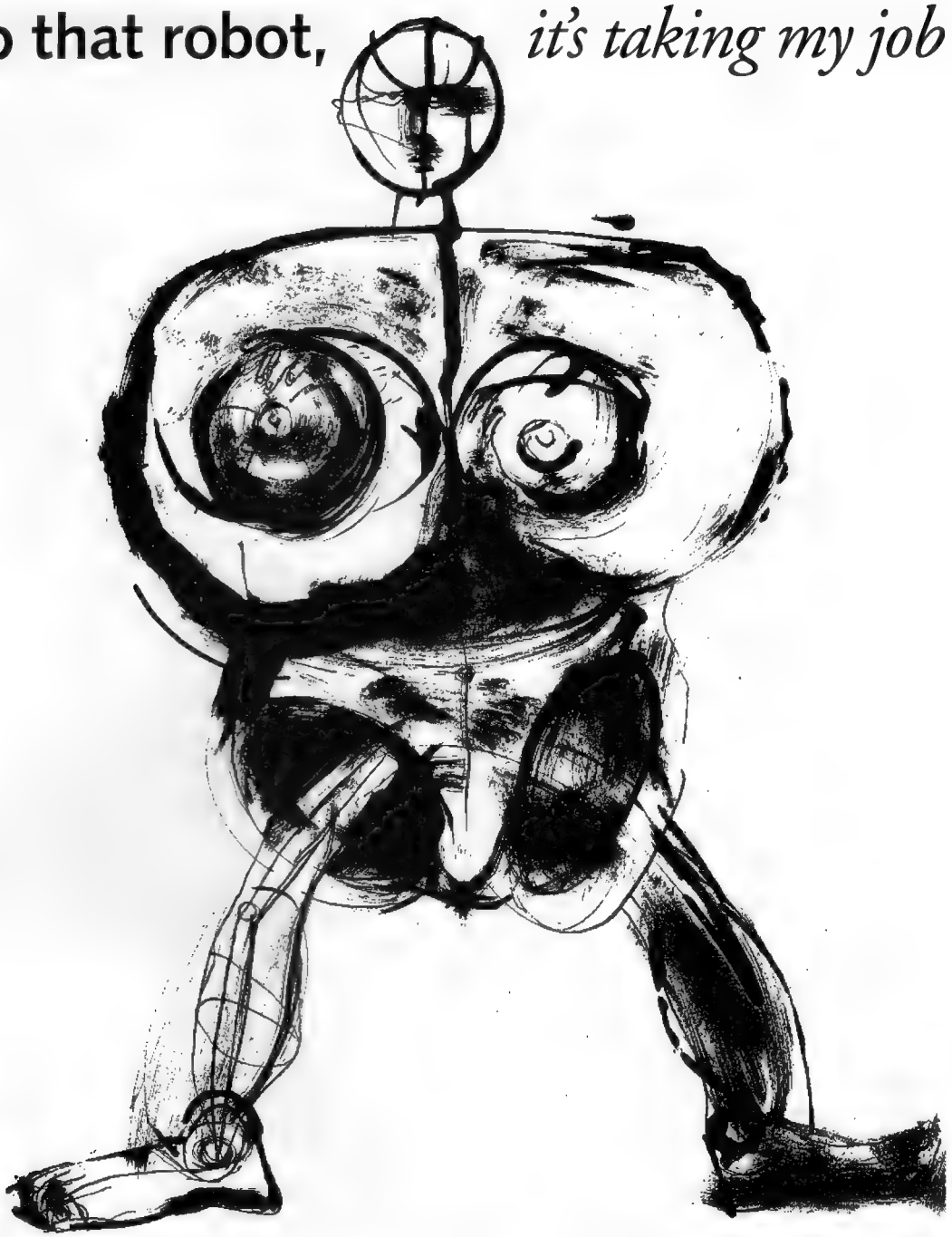
Women in the workforce

"It may be, that the greatest wrong we have done to our children is not the fractured families or the scarcity of jobs, but the creation of a culture that gives them nothing greater than themselves to believe in – no god, no king, no country – and no cause for hope or optimism".

Source: Richard Eckersley in *Apocalypse? No!*

Paul Hendy

Stop that robot, *it's taking my job*



It used to be the stuff of scary, B-grade movie matinees. A generation later robots are well and truly here, and it seems some fear was justified. It is not the nightmare of robots running amok that has provoked concern, but of the opposite, of tireless 24-hour-a-day workers serving their masters all too efficiently, obediently and cost effectively. Robots began as a boon, doing the dirty, dangerous and physically demanding jobs. From there it was only a short clanking stride to competing with human beings for manufacturing and service jobs, threatening a new wave of redundancies, and a new engine in the juggernaut of structural unemployment. ►

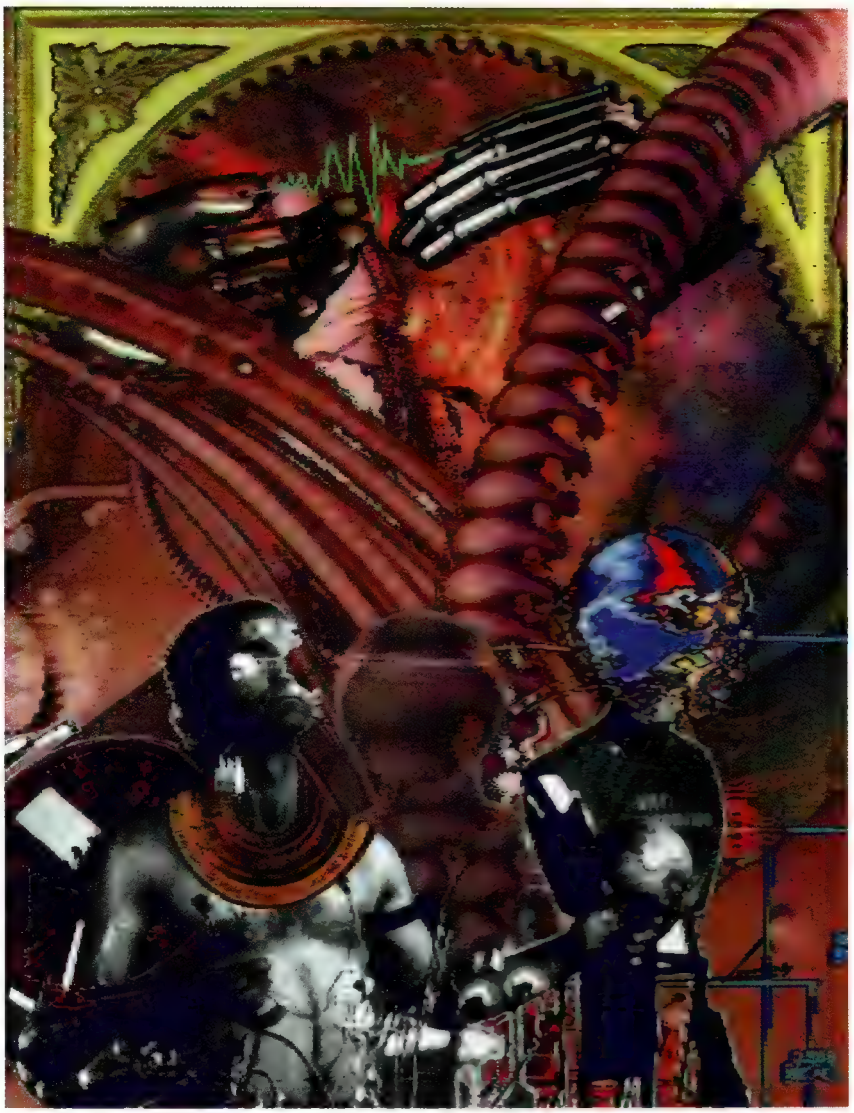


ILLUSTRATION: CSABA SZAMOSY

SERVICE robots with all their brand new bionics and clean uniforms are about to make their debut on the world stage.

The new breed comprise, 'scrubmate' (the toilet cleaner), 'helpmate' (the "fetch and carry" courier), the British robo-surgeon for brain tumors being used in two hospitals, the patient handling robot to save nurses' backs, the German 26-metre-stretching 'Skywash' Jumbo Jet cleaner, and product-disassembly robot. There is also the gangly French Magali fruit-picker, Martha (the mobile cargo handling robot for wharf and rail cargo), the Seattle water-jet cutting robot for processing fruit and vegetables and ceramics, the equal of any laser cutter, and last but not least, Australia's own dexterous sheep-shearing robot – to name a few. Phew!

One wonders what futures are being designed, which ones are being discarded, and which inadvertently overlooked in the new robotics visions? What are the blessings and curses to follow from mechanical-man's new promotion, innovation and planned sociability?

Robots after all, are the most feared and fascinating creations ever to emerge from the high temple of tinkering and science/mechanical rationalising. And what was once a seemingly innocent and neutral pastime of emulating human movement and behavior, now has serious embedded job-displacement elements, precisely at a time when unemployment has reached crisis levels worldwide.

The new service breed appeared at the largest monster bash ever to be held in Australia, the 'Robots for Competitive Industries' conference at the Sheraton Hotel, Brisbane, last month.

Their creators, trainers and promoters are hoping that we can put our fears and prejudices aside to accept the robots into our busy workplaces, and into their techno-economic paradigm of innovation, competitiveness, and new commercial opportunities, if only word can get around.

"It depends mainly on our performance whether our neighbors become a technology threat or a market opportunity for Australia..."

Acknowledged father of industrial robotics, American Joseph Engelberger, says that the new helpers and servers "will be doing all the tasks for us, while humans do the monitoring of robots".

According to various members of the 35 strong Australian Robotics Association (ARA), the conference organisers who are taking a strong economic line, the new service robots are bearing important messages for Australia about exciting new domestic and Asian markets, and for enhancing our strengths which they say "lie primarily in non-manufacturing (especially) food processing, health care, retailing and tourism". They also are preaching the gospel of better jobs (for humans), improved occupational health and reduced human risk, and more time for creativity and leisure.

Professor Hartmut Kaebernick, President of ARA and head of the School of Mechanical and Manufacturing Engineering, says that "some of our neighbors are accepting

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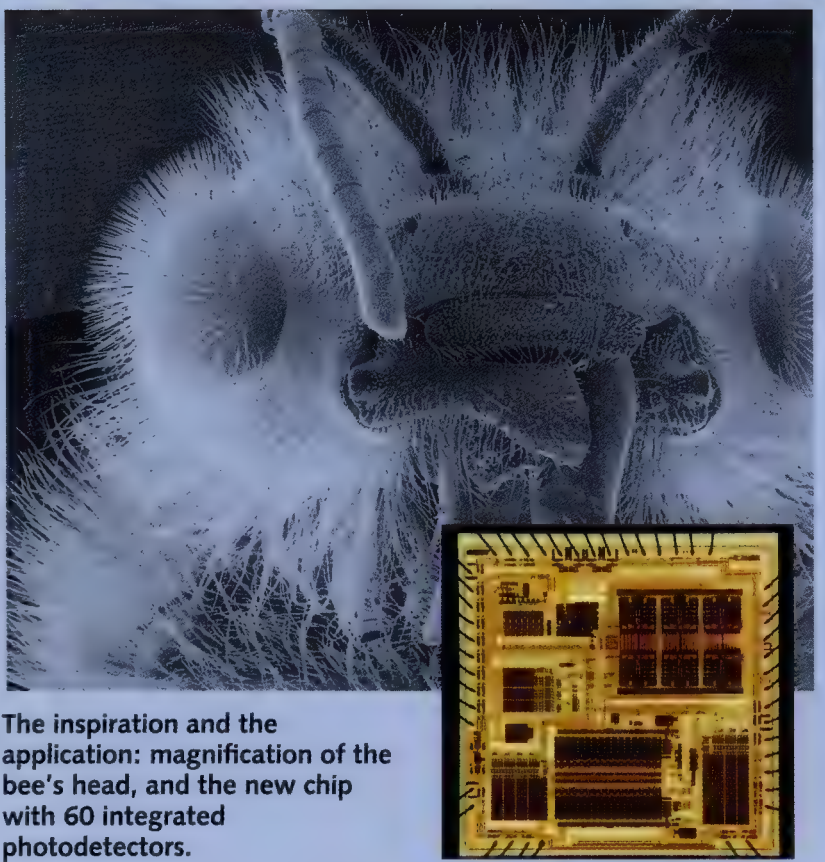
Robot eyes



The inspiration and the application: magnification of the bee's head, and the new chip with 60 integrated photodetectors.

WHILE engineers seek ways to provide simple solutions to human needs, like shearing and "a soil-chemical monitoring robot", Perth University's James Trevelyan, says humanity has yet to come to grips with the most powerful of the body parts – machine eyes. Joseph Engelberger is emphatic: "The secret to success is sensory perception – I can say it over and over – get good sensory perception."

It is a lesson already understood by Australian research scientists. Using biological metaphors, scientists at the Australian National University in Canberra and Adelaide University have created the world's smartest and most advanced robot eye, comprising 60 integrated photodetectors on a chip – six chips of which can be arranged to allow 360 degree vision. It is based on the principles of bee vision.

The belief was that machine technology would do very well indeed if it could perform as effectively as large insects that fly expertly among obstacles in a three-dimensional cluttered world.

The new robot eyes are the work of a 30-strong Australian science team led by Professor Adrian Horridge and scientists and engineers of the Australian National University's Centre for Visual Sciences, and Professor Bob Bogner's microchip-design team at the Department of Electrical and Electronic Engineering at the University of Adelaide.

According to Horridge, the applications are "endless and diverse", ranging not only from aids for the blind, and car bumper eyes for collision avoidance, but all robots and machine tasks. He stresses that when coupled to robots and machines it will do the typical nasties like nuclear reactor work and decommissioning of reactors, chemical de-contamination, sea-bed mining, work in environments that are too hot or too cold, as well as virus handling, quality-control of production, and even "rubbish collecting".

"It will also put all the women of Asia out of a job if it adorns the head of an automatic rice planting robot, it's that powerful," he says.

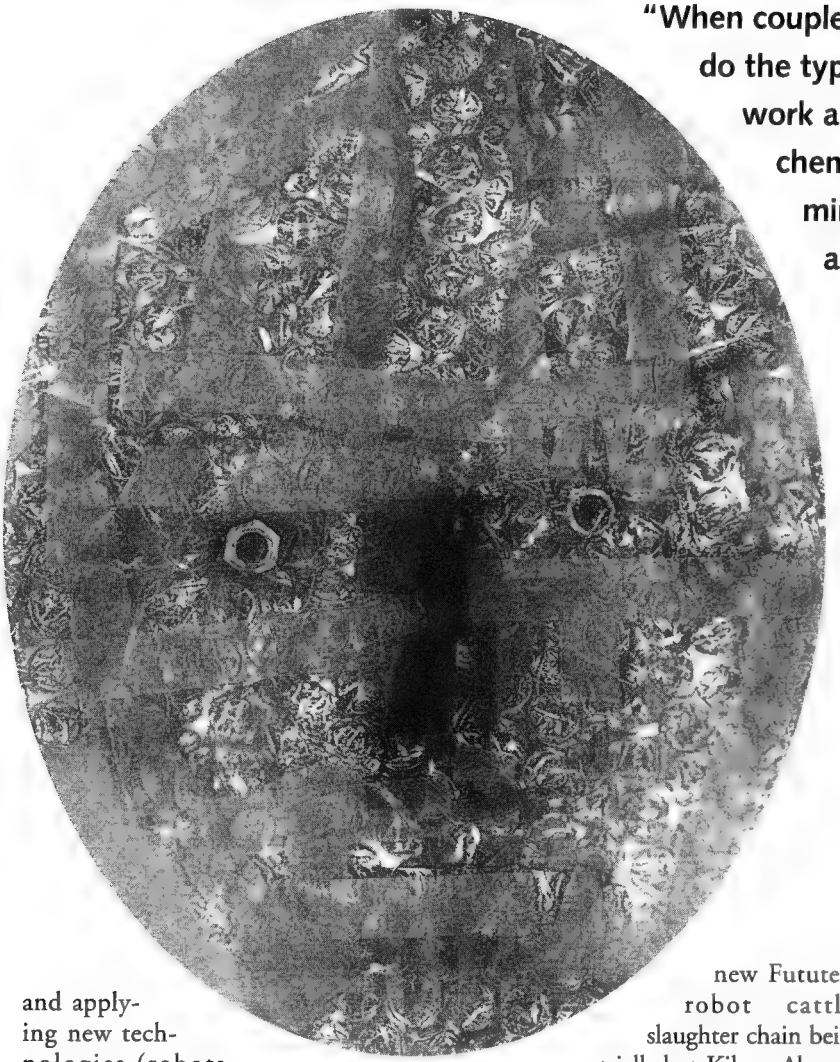
Vision has always been a major stumbling block in mechanical man's perception, and answers lay in a multi-disciplinary effort that "has lessons for all researchers, in robotics and artificial intelligence", Horridge says. Electrophysiologists identified neurons which are vital components of a bee's visual processing, biological behaviourists identified how bees fly and measured their visual behaviours. Then mathematicians and electrical engineers developed the smart 'parallel' architectures.

Internationally-renowned Professor Kamran Eshraghian, director of Australia's Centre for Gallium Arsenide Technology at the University of Adelaide provided the very high speed, very large scale integration (VHSVLSI) techniques to design the chips, while colleague Dr Abdesselam Bouzerdoum provided the "algorithmic compression" and parallel processing skills.

Overall, this robotic body part is a tribute to the collaborative power in bringing biological disciplines into the classical research goals. Much of the image processing is achieved "at the front-end" of the eye automatically rather than in the brain.

Bouzerdoum and Eshraghian stress that "computational costs with conventional algorithms have prevented machine vision implementations on anything but large scale and expensive computers. Now a competitor has emerged."

Professor Ray Jarvis of the Intelligent Robotics Research Centre, an ex-ANU vision scientist himself, is calling for a new Co-operative Research Centre (CRC) to be established which could bring the widest range of disciplines under one roof so as to cross-fertilise ideas "daily, in a face to face", to break down the barriers that are limiting approaches and innovation in vision and intelligence. "If we don't we will miss the applications boat again," he says. ★



"When coupled to robots and machines it will do the typical nasties like nuclear reactor work and decommissioning of reactors, chemical de-contamination, sea-bed mining, work in environments that are too hot or too cold, as well as virus handling, quality-control of production, and even 'rubbish collecting' ".

ILLUSTRATION: JUSTIN GARNSWORTHY

and applying new technologies (robots and computer-integrated-manufacturing) at an alarming pace", citing Indonesia and its robotic aircraft factories, and 'clever island' Singapore with its new automation policy that is set to boost its 1536 robot workforce.

"It depends mainly on our performance whether our neighbors become a technology threat or a market opportunity for Australia," he says. ARA has its eyes firmly focused on recent Japanese Industrial Robot Association figures that 99% of Japan's 275,000 robots are manufacturing robots, and only 1% in service. That translates into golden opportunities for Australian technology.

At the opposite end of the spectrum, Les Day, the Federal President of the Australasian Meat Industries Employees Union says that CSIRO's new Fututech robot cattle-slaughter chain being trialled at Kilcoy Abattoir in Queensland will "do away with a hell of a lot of labor – 10,000 meat workers Australia-wide, easy. It will never be as fast (as humans) – only 300 cattle a shift – but they can run it 24 hours a day."

What will the new robots do to skilled and unskilled labor such as the 150,000 cleaning jobs, 15,000 fruit processing jobs (in one union alone), 6000 shearing jobs, and to health care industry positions?

In a recent European survey, 200 hundred users found that an $80,000 dollar robot working a single shift costs $10 an hour, but on three shifts it is only $3.40 an hour, which will have economic rationalists rubbing their hands with glee. Robots are also living longer (1000 hours before breakdowns, and 8 year lifespans).

Engelberger's R2D2-like "helpmate" couriers, which are currently doing "fetch and carry" tasks of blood supplies, medicines, records, and late meal delivery in 12 US hospitals, can be rented for $5 an hour, "half the cost of equivalent labor", he says. More advanced couriers are being developed with laser 'LIDAR' vision, and ceiling celestial navigation skills for commercial office tasks and small industry. Out go the mail boys, storemen, and others.

Who decides which jobs can be classified as those of the "fetch and carry" mould, as well as those of the processing "sort and select", and even simple 'pattern (vision) recognition' tasks of inspection and packaging. These tasks will be increasingly covered by the new robotics.

Perhaps it will be seen as a godsend to allow people to be "freed up, to be relocated elsewhere", says Dr Richard Willgoss, Kaebernick's colleague at the University of New South Wales.

All the talk of the clever country and everybody thought they meant us! Robots are already being trained through so-called "show and repeat" programing for spray-painting tasks, and Professor Raj Reddy of Carnegie Mellon's Robotics Institute is working on automatic 'observational' programing of a robot – where "the robot looks over your shoulder and learns the movements of a task like assembly and then goes away and repeats it".

Engelberger's 12 scrubmates working in US Post Offices are an example

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Virtual Robots

Scientist debriefs pilot at the tri-screen human interface of the 'pilot's associate'. The PA's end effectors, the 'real brain', are not revealed.

JUST AS PEOPLE are coming to grips with the physical realm of robots, along comes an idea so revolutionary that other robotics visions almost pale into insignificance. What if you take the brain completely away from the robot and stitch it into a totally different task-oriented environment?

This is the new virtual robot and it is being placed into the brave new interconnected "nervous" architecture of the communications, information and knowledge age.

Virtual means "virtually a robot", as much as it means a brain that can simulate the structural complexities of human intelligence, rather than emulating human movement and behaviour.

Virtual robots, also known by the alias of 'real brains' and 'artificial agents', are the idea and vision of Dr Michael Georgeff, Director of the Australian Artificial Intelligence Institute (AAII), in Melbourne (see also 21C, issue 9). While some may abhor the thought of assistant-brains and manager-brains, this virtual robot has more flexibility and applicability than its physical cousins for tasks which Georgeff calls "detail handling" and "decision making".

His first virtual robot has been supplied to NASA to manage malfunctions on the Space Shuttle. He also bid to supply the R2D2 brain, called a 'Pilot's Associate', for the US Defence Department's new military aircraft. As one Pentagon official said, the PA must perform thousands of mission, aerodynamic, and navigational tasks per second – "tasks that would normally require 10 to 20 humans".

Dr Gustav Meglicki of the Australian National University's Automated Reasoning Program says that Georgeff's new robots are an achievement that "all Australians can be proud of – he has developed a generic robotics software that will be used from this point onwards on all NASA robots wandering out there in space, and for limitless other applications."

The only Australian virtual is the OASIS assistant for Air Traffic Control, which is currently being trialled at Sydney Airport to help in the 60-plane-an-hour congestion, and to reduce workload of human operators. Another is being developed for medical anaesthesia tasks.

Georgeff says that these virtual robots are born with different sensors and different end-effectors (virtual hands), and work in a different environment, but they still have to make decisions and act. They could be sitting there watching chemical processes, watching transactions on the stock exchange, or running factories and telecommunication networks.

"That view is very important because the physical robot is in fact a very narrow view. The physical robot is a complex and difficult development task and much more capital intensive because it is very hard to build good sensors, especially if vision is important, and hard to build effectors to emulate human capabilities.

"Both sides are interesting, intellectually, and real robots can be good for very specific jobs like Trevelyan's sheep shearing robot, but their applications are not as diverse as virtual robots. In fact there are a million tasks that you can build these virtuals to preform, which can make a huge impact on the way we do things in the world. They fit perfectly into the Australian landscape of infrastructure and business," Georgeff says.

In current practice, Georgeff compares robo-OASIS to the primitive, task-limited "golden delicious" apple picker, but as more is learnt about what he calls "beliefs, desires, and intentions", evolution will occur. In theory, the virtual robots can be the size of HAL, the living spaceship in the film 2001 which is sensate over its entire structure, or even larger – to sense, feel and manage dynamic cityscapes, airscapes, and perhaps even future Japanese "technopoli".

This image of a brain-only roboticized world, hard-wired to numerous local and remote sensors throughout an architectural nervous system, unrestricted in spatial terms, is both awe-inspiring and frightening. This is both a scientific, fragmented, dismembered vision for a 'functional-metropolis of 2010' as much as it is about an inevitable, evolutionary step towards a technology which mirrors our own unique image and biological organisation.

One thing is certain, the implications in terms of future work and jobs is no greater or less than that posed by physical mechanical man. Who decides which human tasks represent "detail" functions and "decision-making" functions to be replaced by virtual robots? ★

of the new trend towards interactive languages and away from the "agony of classical programing techniques", he says. Using wrist-force sensors, which provide spatial and force data by "reflection", his engineers go through the physical cleaning motions which provide the robot with the necessary in-house toilet-cleaning training.

Dr Michael Kassler, of Robofoods Pty Ltd, who is trialling a ginger-sorting robot: "In the developed world, there is an increasing reluctance to use manual labor for tasks that are so simple that a machine can be programed to do them." The "human robot" is thus saved, replaced by an artificial copy.

What is the 'soul' in the new machine? What type of society are the new breed of robots leading us towards? Do we want to become a mechanically-serviced Australia? Do we want to be roboticized, "to make better citizens out of us on new 'Fordist' production lines, humans as an addendum to the machines, and technologized humans", asks Dr Ian Barnes of Murdoch University's Institute for Science and Technology Policy.

He adds: "The paradox is that just as the technology has become so sophisticated, to begin to mimic and approximate a human, 'what is it to be human' becomes much more problematic."

To Dr Kassler, service robots are part of a grand structural plan. He cites Buckminster Fuller who "noted some years ago, structural change (allows) ordinary people to be richer today than kings and queens of yesterday in terms of access to education, information and nutrition, sanitation, travel and communications...(change provides) reduced working hours, greater incomes and prospects". And the antagonists in his world view? They are a conservative management "with a back to core industries ethos – the big culprit", who are blocking commercialisation of technologies, as well as senior

Robots shear magic

Associate Professor James Trevelyan's sheep shearing robot – clever research and yet another heroic investment failure.

PERHAPS the most powerful message surfacing from the new robotics enterprise is that there is now such an overload in the big three technologies comprising robotics – perception (vision, touch and speech), artificial intelligence, and mobility – that scientists and engineers are calling for 'technology-conservation'. The Repco robotic supermarket is already jammed full of "off-the-shelf" mind and body parts waiting to be applied.

This is certainly one of the messages from James Trevelyan, of Western Australia's Perth University. His robot sheep shearer is one of the kinematic and mechanical successes in the most challenging areas of service robotics – the messy, disordered irregular world – and the robot is now one of the fastest and most agile examples. Created by a team of engineers and scientists over 16 years, the robot has an advanced terrain-following, irregular surface-following capability and unique motion control techniques which overseas researchers now "hail as an example of just how clever robots can be" (*Robots for Shearing Sheep: Shear Magic, 1992, James Trevelyan*).

Joseph Engelberger says that the robot has the fastest servo-drives in the West, and that the sheep handling mechanisms alone are powerful enough to begin a commercial revolution, besides the Edward Scissorhands.

Developed to save the sheep farmer on the land from plummeting wool prices and $400 million annual shearing costs as well as saving some "iron men of the outback (from) broken backs, arthritic joints, dermatitis and kidney disease", Trevelyan says that the techniques to develop this advanced robot have been around for "five to 10 years, and only required some listening and a little lateral thinking". Also his robot "serves only as an extension of human activity, not as a replacement".

The sheep shearer, with its advanced kinematics, could find applications in manufacturing to paint or heat-treat irregular shaped surfaces, or in packaging, but it might be another "heroic failure" of clever research and dumb development where Australia lacks the investment-will to select and follow through with its better robotics investments.

Farmer Lance Lines and engineer Ralph Arthur's robot shearer, called the Merino Wool Harvester, is another project struggling to find capital after Elders sponsorship collapse. It is now in Sydney's Powerhouse museum. ★

Federal bureaucrats resisting the introduction of a robotics-centred automation policy.

Many people might be happier if three of Yukio Hasegawa's seven laws are adopted. Hasegawa is a Professor of Waseda University's Systems Science Institute, and winner of the 1977 Joseph Engelberger Award for Robotics.

Law Number One is that 'Robots shall be built and used to contribute to human welfare and development'; Law 2, 'Robots shall never usurp work from humans that humans want to do themselves'; and, law 5, 'Before robots take over human work, the humans affected shall be asked for their consent'. Try running that one past the roboticists.

If a similar 7 laws were introduced for technology, then perhaps Professor Rolf Schraft's product disassembly robot would pass an 'environmental recycling' law. This is a "very exciting project with a tremendous market future", says Schraft from Stuttgart. He says new laws to make manufacturers responsible for recycling their own goods are expected to be passed in Germany in two years time. That will also impact on product design.

But does Schraft's advanced 12-axis-movement, tyrannosaurus-sized, 'Skywash' jumbo jet cleaner pass the test? Skywash is currently at work on Lufthansa's planes at Frankfurt, at a time when unemployment is high in Germany. And his autonomous, driverless, agricultural harvesters? The latter are just a small visionary part of his new DM1,000,000 study for the Federal Ministry of Research and Development to analyse the potential of service robots and robotics.

Germany is after all the home of Fritz Lang's *Metropolis* (1926) where humans, to use a techno-term, are stuck "in the loop" and then finally dispensed with by robots.

And don't think professionals are exempt. Engineer Patrick Finlay, managing director of Armstrong Projects Ltd, has produced two 'robosurgeons' under the United Kingdom's advanced medical robotics initiative. He says the robots are "not quite Nobel stuff, but they are in that league", and adds that "in 20 years time we will consider it absolutely barbaric that one human being should take a knife to another".

One robo-surgeon called 'neurobot' removes brain tumours with micro-precision and with "less invasion, trauma and collateral damage". Neurobots are in use in two European hospitals, and will soon enter service in a leading London hospital. The other is 'laparobot' for abdominal surgery. Although surgeons are not out of a job – they control the robots from their image-scanning computers and helmet virtual-displays – British consultant surgeon Mr Masell Griffiths says "robotic surgery will be considered by a large body of practising surgeons as unacceptable, wholly impracticable and perhaps even unethical".

One thing is certain, the new robotics world is full of the excellent, the good, the bad and the ugly. And a lot of that excellence and "technology-ripe" innovation in machine vision and artificial intelligence (the robot brain) resides in Australia.

MACKENZIE WARK of Macquarie University has put it succinctly: "Technology has an eternal return – it just keeps coming back, always different in what it does...it is something which we must wrestle with all the time."

Anticipations and concerns are set to bubble in this deterministic micro and macro technology vision coming our way, in a big way, riding an economic and intellectual wave. Does it require an ethical watchdog like in genetics?

Scientists like Adrian Horridge see some chilling implications for society which mishandles the technology, for example a future workplace monitored by a 20-20 or 15-15 vision system. He is concerned about losing ethical control of his technology: "Do you want personnel mines with eyes?" And he is concerned about commercial threats to Australian innovation: "What about the overseas PhD students who will return to their countries with the technology and ideas that we are supposed to compete with internationally."

One thing is certain, only the tip of an iceberg has been sighted – the submerged part includes "microrobots and nanomachines, artificial creatures (see 21C issue 4), virtual robotic programing, and the Japanese Industrial Robots Association's "personal robots" which will, by the beginning of the 21st century, "serve people in every aspect of their lives", according to a recent JIRA study.

In the practical sense, perhaps roboticists and others are infected with a technoism – a belief that technology always serves humanity and if not directly so, ultimately so.

But the real story may lie in Japan – the kingdom that many Western roboticists revere for their applications successes. In a recent media program, extensive and violent disciplinary force was shown to be used by Japanese teachers on school children in order to "mould them into a nation of robots", as a one professor lamented, robbing them of the individuality and creativity that people in the West prize dearly. That is in the paradise of robots, where robot fever exists.

Georgeff, representing the virtuals, says "it would be great if we could get people out of the detail business which they are terrible at and into the creative part which they are good at".

For the sake of the current human crisis on all levels – employment, economic, social and spiritual – let us hope the robot-dreamers and implementers are correct.

But just to be on the safe side, we better prepare ourselves for the second coming of artificial man and his new mates. ★

Guy Nolch

The red tide of death: outcome of an outfall

Since the Water Board in Sydney extended its ocean sewers out to sea, bathers have been the only creatures to benefit from better water quality. Sydney's sewage is now pumped directly into the East Australia Current, and has been feeding toxic algal blooms which may be linked to marine deaths and shellfish toxicity as far away as Hobart and New Zealand's west coast. However, the Water Board maintains that algal blooms are a natural phenomena and has been reluctant to adopt advanced sewage treatment technologies.

THERE IS A SAYING that you can't actually swim at Bondi Beach — you merely go through the motions. It was the Sydney City Council's idea 100 years ago to pump sewage into the ocean at Bondi, but at that time bathing during daylight hours was illegal and Bondi was remote an underdeveloped. Since then, however, the Water Board's practice of pumping effluent directly into the sea from its coastal sewage treatment plants has given Sydney's beaches a notorious reputation.

In response to growing public concerns over the water quality at Sydney's beaches, the Water Board has extended the underwater sewage pipelines at Bondi, North Head and Malabar further out to sea. Since then the quality of the water at these beaches may have improved, but the extension of Sydney's ocean outfalls has now been blamed by some scientists for a wave of death affecting penguins, whales, birds, fish and oysters along the Australian and New Zealand coastlines.

"We are poisoning the ocean pretty much all the way between mainland Australia and New Zealand," says Wollongong scientist Chris Illert, who matched satellite photographs with cases of penguin deaths, whale strandings and mutton bird deaths over 10 years. Illert found that widespread death follows the formation of a 'red tide', which is a planktonic broth that forms when nutrients in sewage combine with warm water in the East Australia Current. These red tides can be tracked by satellite photographs as they flow south along the east coast of Australia.

"Red tides have been horrendous since Sydney's sewers were extended out to sea," Illert says.

Each December and January a wave of death follows the passing of the red tide. "Mutton birds wash up in their thousands along Wollongong's beaches; whales wash up at about the same time, and Sydney's rock oysters go toxic," Illert observed.

"A week or two later the penguins around Jervis Bay start dropping like flies, then a bit later the penguins at Phillip Island die and there's usually a few whale strandings. Then a week later the Tasmanian oysters go toxic. Just about every January they have to close the Tasmanian oyster beds — they're just too toxic to eat.

"About 6 months later it goes in a big anti-clockwise loop and comes up the western coast of New Zealand and causes whale strandings mid-year.

"So there's a wave of death, and it's an interspecies death. You can actually track it by satellite."

The red tide is a cocktail of primitive planktonic organisms that first evolved when the Earth had an oxygen-free atmosphere. The plankton respire anaerobically, pumping sulfur dioxide into the air instead of oxygen. "Some 30% of the oxygen we breathe comes from the green plankton in the ocean," says Illert. "We can't afford to upset that balance and make the red plankton come back."

Illert has likened the red tides to a sort of underwater acid rain. "Australia is in the Big League of polluters. The amount of sulfates and phosphates we are pumping in from our sewage system can only be compared in terms of total environmental devastation to the logging of the Amazon rainforest. We had the highest level of red tide poisoning in the southern hemisphere in history in Melbourne's oysters last year."

However, Illert's explanations of the marine deaths are not shared by Duncan Leadbeater, the Executive Officer of the environmental research group Ocean Watch, who says that penguin deaths at Jervis Bay are caused by natural events. "In a good year the penguins may lay a second clutch of eggs," he says, "but this may not come off if the currents change and bring water that is poor in nutrients." In such cases the penguins must swim further out to sea in search of food, and often they may not be able to return to

ILLUSTRATION: MICHAEL DALY

shore. As a result penguin chicks may be left to starve.

Leadbeater is joined in his criticism of Illert by Dr Gustaaf Hallegraeff, a Lecturer in Aquatic Biology at the University of Tasmania, who has been commissioned by the Water Board in Sydney to determine whether there is any firm evidence linking the extension of Sydney's ocean outfalls with the formation of red tides. While Hallegraeff acknowledges that nutrients in sewage can contribute to algal blooms, he maintains that red tides are naturally occurring phenomena that existed before Sydney's ocean outfalls were extended. "Blooms of the blue-green alga Trichodesmium erythraem were reported in the region by Captain Cook in 1770, and the dinoflagellate Scrippsiella trochoidea created a major red tide in Sydney Harbour in 1890," he says.

Hallegraeff says that Illert is "treating red tides as a single black box that is responsible for marine death and shellfish toxicity". Instead, Hallegraeff believes that individual factors within algal blooms need to be examined.

"More than 10,000 species of organisms exist within these algal blooms, but only 40 or so have the potential to cause harm to marine life or poison human consumers of seafood products. There is no need to close down oyster beds whenever there is an algal bloom — we need to make decisions after examining which organisms are present."

However, Illert is unfazed by such criticisms. "One thing that critics of me seem to have in common is that they seem to be funded by the people who have an interest in pumping sewage into the ocean, and whilst I'm not suggesting necessarily that they're lying, they seem to have a predictable point of view."

Illert is particularly sceptical of Leadbeater's criticisms, saying that the fishing industry, which funds the activities of Ocean Watch, is worried that drops in fish sales will occur if the public believes that fish caught in a red tide may be too toxic to eat.

Illert also warns that, while red tides may indeed be a natural event, the scale of their destruction of marine ecosystems has increased since industrialised nations began building ocean sewer systems in the 1930s.

ILLERT is concerned that scientists are afraid to speak out against the Water Board. One person who did speak out is Sandy Thomas who, 17 months after resigning as the Water Board's Public Relations Manager, accused the Water Board of making "grossly unethical" claims. Thomas had prided himself on maintaining a policy of openness and public accountability for the Water Board's actions. However, this policy was not tolerated by his superiors. "In my last weeks at the Water Board...many managers, including myself, came under strong pressure to reverse or scale down this policy of openness. After I left...the policy of openness was deliberately, and quietly, abandoned." Thomas said that in the 17 months following his resignation, Water Board workers had been "directly ordered not to speak publicly" about beach and ocean pollution problems. "Many people in the Board, including some of its most senior managers and spokespeople...have been massively misled and are caught in a web of fabrications and cover-ups by others."

In 1989, Thomas criticised the Minister for the Environment for having conflicting interests, being responsible for both the polluter (the Water Board) and the policing authority (the State Pollution Control Commission). Thomas says that this conflict of interest was highlighted by laws within the Clean Water Act, which specified that the SPCC must obtain the Minister's approval to prosecute the Water Board if the latter broke the law.

The Minister's dual responsibilities also reflected Illert's criticisms of Leadbeater's interests in protecting the fishing industry. Thomas says that the Minister for the Environment, Tim Moore, agreed in 1989 to suppress monitoring data that revealed hazardous chemical contamination of fish and other organisms. This resulted in the rewriting of the SPCC's 1987–88 annual report to State Parliament, in which references to the data were deleted.

However, this conflict of interest was resolved last year by the new State Government in New South Wales. While the Minister for the Environment remains responsible for the EPA (which absorbed the SPCC and other smaller bodies), the Minister for Planning and Housing is now responsible for the Water Board.

Even so, Thomas remains critical of the Water Board's selective dissemination of information, such as the Water Board's failure to reveal the extremely poor performance of its treatment plants and its failure to reveal internal reports that cast doubt on the efficacy of its selected approaches. In particular, Thomas is concerned that the Water Board is continuing to trial advanced primary treatment facilities, which merely remove solids and suspended particles from sewage, while ignoring the possibilites of secondary treatment, which uses micro-organisms to digest biological wastes.

At present the Water Board is trialling a number of advanced primary treatment techniques. Most recently the Water Board launched SIROFLOC, which uses magnetism to remove suspended solids, grease and heavy metals

"We are poisoning the ocean pretty much all the way between mainland Australia and New Zealand," says Wollongong scientist Chris Illert, who matched satellite photographs with cases of penguin deaths, whale strandings and mutton bird deaths over 10 years.

from sewage. The SIROFLOC process was developed in conjunction with the CSIRO and launched last May at the Water Board's Malabar plant, where it will treat 5 million litres of sewage each day (the sewage generated by a population of 20,000).

The SIROFLOC process begins after sewage has been screened to remove large materials such as plastics and paper. As the sewage enters the SIROFLOC plant it is screened again to remove fibre and smaller solid particles. Next the wastewater passes into a tank where it is mixed with particles of iron oxide called magnetite. Organic matter, grease and other impurities in the sewage cling to the magnetite and, as the mixture passes two powerful magnets, the magnetite and clinging solid wastes are drawn into clumps that sink to the bottom of the tank. This entire process takes only 15 minutes, after which the water leaving the plant is 90 per cent free of solids.In June, the CSIRO announced that SIROFLOC set a new record for sewage treatment when the process removed 85 per cent of suspended solids and 90 per cent of oils and grease from a sewage sample in only 15 minutes. This was 40 times faster than the conventional processes.

SIROFLOC was originally invented as a method for purifying drinking water, and the Water Board is currently investigating whether SIROFLOC can produce wastewater suitable for re-use. And although it is said that a glass of water in London has already passed through seven or eight sets of kidneys, the Water Board will be content if it only recycles water for use by industry.

SIROFLOC is not the only sewage treatment process being trialled by the Water Board. The MEMBIO process, which was developed by Memtech along the principles of ultrafiltration, was launched at the Cronulla Sewage Treatment Plant last October. The MEMBIO system consists of a bundle of hollow straw-like fibres that are perforated throughout their length by millions of tiny pores. As effluent is pumped through the system, solid wastes stick to the inside of the fibres while wastewater escapes through the pores. The fibres are cleaned regularly by a high pressure backwash system. The MEMBIO facility currently treats up to 2 million litres of sewage per day, which is approximately 5 per cent of the sewage flow at the Cronulla plant.

A NUMBER of other processes are also being trialled by the Water Board: Chemical Assisted Sedimentation, which is on trial at the Cronulla and Bondi plants, uses chemicals to form a sludge of sewage solids that sinks to the bottom of the treatment plant; Dissolved Air Flotation, which is being trialled at North Head, uses coagulating agents to form a scum that is brought to the surface for removal by air bubbled at high pressures; and a further trial, in which sewage solids become deposited onto a series of lamella plates, is taking place at Bondi.

However, these advances in primary treatment are likely to produce only incremental improvements to the quality of wastewaters. Further, these technologies are unlikely to overcome the performance inefficiencies documented by Thomas, who says that these inefficiencies are exacerbated by wet weather. "All three of the main coastal sewage treatment plants are overloaded during and following wet weather, especially the large Malabar plant, which is responsible for most of the sewage pollution of eastern suburbs beaches from Bondi to Malabar. This frequently results in discharges of raw or partially treated sewage and sewage sludge. The lumps of grease washed onto beaches in these conditions are frequently contaminated with other wastes, including discarded hospital wastes and syringes."

Illert agrees. "The stormwater system is an overflow for raw sewage. So-called 'pumping stations' are just overflow points so that whenever you get a good rain the sewage just goes into the nearest creek or river and straight into the sea."

Peter Fagan, the Manager of Environmental Projects for the Water Board, concedes that overflows are a major problem in the older developed parts of Sydney. He says that up to 50 per cent of houses have illegal connections such as swimming pools that feed directly into Sydney's sewage system. To that end, the Water Board is set to spend $2 billion over the next 10 years on a program designed to detect illegal connections and cracks in existing sewers. The program involves pumping smoke into the sewers and watching where that smoke comes out.

Whether or not this program reduces sewage overflows remains to be seen. Even so, Illert says that Sydney's sewage problems were solved in 1982, when an independent parliamentary Standing Committee determined that it would be millions of dollars cheaper to pump Sydney's sewage over the Blue Mountains and into the area surrounding Bathurst. Not only would this be cheaper than building ocean outfalls, but the nutrients provided by the sewage would enable market gardens to thrive to the tune of $20 million per year.

Instead, the ocean outfalls were built, pumping Sydney's sewage directly into the East Australia Current. "Why did they do this?" Illert laments. "It was not recommended!"

Fagan says that the proposal was rejected because such a program would be prohibitively expensive. He says that the energy required to pump the sewage as far as Bathurst would have necessitated the building of a new power plant. Fagan also says that the huge volume of nutrient-rich water pumped through the pipeline would have had detrimen-

tal environmental consequences on the area around Bathurst, including major problems with salinity.

Thomas is sceptical of the Water Board's costings of such a program, saying that, even though no new studies on the feasibility of the Blue Mountains pipeline were carried out between 1987 and 1989, the Water Board's estimates of the cost jumped from $1.5 billion to $3 billion dollars during that time. But Thomas agrees with Fagan that the Blue Mountains scheme would have disastrous environmental consequences. He believes that it would be more feasible to recycle wastewater for use by industry.

Illert maintains that the decision to build ocean outfalls has resulted in equally detrimental environmental consequences. "The East Australia Current is meant to be clean fresh tropical water that restocks all the fisheries down the south coast and flushes the filth away, yet they've put the sewers into the middle of it. It's the last place any sensible person would put it."

A recent study by the Water Board has noted that the frequency of reports of red tides has increased over the past 20 years. However, Fagan says that a growing awareness of red tides and the availability of more sensitive detection techniques may be responsible for the increasing number of reports. He maintains that the biomass produced by Sydney's sewage is insignificant compared with the total biomass in the oceans, and contends that there is no need to upgrade the treatment of sewage released from deepwater outfalls as the distance between the sewer outlets and the beaches will sufficiently dilute the concentration of pollutants.

Hallegraeff disagrees with Fagan's view of oceans as an enormous waste disposal site. "While the building of Sydney's ocean outfalls may have improved beach qualities at Bondi and Malabar, it can be viewed as only a temporary solution, displacing the sewage problem rather than solving it."

The East Australia Current picks up the sewage from Sydney's outfall, polluting the ocean as far away as New Zealand

HALLEGRAEFF believes that sewage treatment must be improved and supports Illert's views that we must also find a beneficial use for the sewage. "Sydney's sewage needs to be treated better if it is to be used to fertilise pastures as the sewage includes industrial pollutants, and these would poison crops."

Sharon Beder from the University of Wollongong believes that better treatment technologies will not remove industrial pollutants from sewage. She says that the SIROFLOC process is only an advanced form of primary treatment, and that the chemicals present in industrial waste will kill the microorganisms used in secondary treatment to digest biological waste.

Beder says that the only solution to the problem is for more stringent requirements for on-site treatment by industry. At present, regulations control the concentrations of chemicals that can be released into public sewers by industry, and in 1994 these regulations will be tightened so that industrial waste will be treated to the same standards as domestic effluent.

But whether or not these regulations are strictly adhered to remains to be seen. Illert is sceptical as to whether these regulations will be adequately policed, and Beder says that industry is prepared to flex its muscles once it is established in Sydney. "When I had a meeting with the Water Board's Manager of Trade Wastes in 1988, he explained to me that the ban on the release of mercury into the sewers was going to be lifted in order to reflect the fact that industry had always dumped mercury into the sewers – the ban had never been policed. In May 1989, the State Pollution Control Commission put limits on the concentrations of mercury that could be put into the oceans by the Water Board's licenses. In July 1989, these limits were changed from maximum concentrations to median concentrations. Later the median concentration allowed at Malabar was loosened by four times, and a document I have by the State Pollution Control Commission states that the mercury limits had been loosened to accommodate the amount of mercury the Water Board allowed ICI to put into the sewers." Beder says there is now no limit to the amount of mercury that can be released by industry into Sydney's sewers, even though the toxic nature of mercury is well documented.

The need for cities like Sydney to attract and retain industrial giants like ICI may explain why the Water Board has been reluctant to introduce secondary treatment of sewage, which is incompatible with industrial wastes. Thomas says that the Water Board "grossly exaggerated 1989 'estimates' of the cost of secondary treatment", and that these "rubbery" figures came at a time when the Water Board "started arguing vociferously against secondary treatment". At this time the Water Board warned the public that they would need to double or triple water rates if they were to upgrade Sydney's sewage treatment facilities.

Beder however levels much of her criticism at sewage engineers. In a paper published in June by the Institution of Engineers, Australia,

"Red tides have been horrendous since Sydney's sewers were extended out to sea," Illert says.

Beder argued that engineers dictate the range of technologies that will be accepted by Governments. "Authorities may set standards and regulate the available money," she wrote, "but the engineers decide how to meet the standards that cannot be met by the available technology."

Beder argues that the standards set by authorities are determined using obsolete monitoring techniques that ignore current knowledge concerning the health risks associated with sewage. For example, the presence of viruses was not known when current techniques were adopted. "Although sewage may contain as many as 110 different types of virus, conventional sewage treatment processes cannot be counted on to remove them," Beder says. "Primary sedimentation does not remove viruses or pathogenic bacteria at all." The monitoring of effluent is confined to measuring the concentration of faecal coliform even though there is no statistical correlation between this and measurement of viruses and pathogenic bacteria. Beder warns that government regulatory authorities are unlikely to set standards for viruses in sewage because "the problems created by toxic chemicals and viruses are hard to prove, invisible, and their effects long term".

Beder says that modern engineers are locked into the decisions made by their forebears at the turn of the century. "Many treatment plants built when sewage flows were smaller and public expectations lower do not have the space available nearby to expand and incorporate, for example, secondary treatment." But she argues that that the adoption of advanced treatment technologies is hindered most by the paradigm set in place by those forebears, which ensures engineers choose "the cheapest treatment process for a given situation that will perform the minimum treatment necessary to conform with local regulations and standards without offending the sensibilities of the public". Accordingly, treatment decisions were based solely on economic costs, and did not take account of environmental costs.

SINCE then the composition of sewage may have changed with the growth of industry and the increased use of inorganic and artificial materials in industrial processes, but sewage treatment has not been adapted to remove or treat toxic chemicals, heavy metals, organochlorines, or most of the grease and oil contained in the sewage. Further, viruses and heavy metals tend to become concentrated in the sludge extracted during the primary treatment process, making incineration, burial and dispersal of sludge in the sea environmentally hazardous, even if it has been treated. At present, no treatment technologies are capable of decontaminating the sludge. Beder says such technologies will not be developed until engineers accept that the present paradigm has failed, and then undertake research and development of appropriate treatment technologies.

One treatment technology that is already available but not widely implemented is nutrient extraction. Since it is the nutrients in the sewage that are responsible for feeding toxic red tides and choking waterways with excessive plant growth, it makes sense to introduce nutrient extraction techniques to Sydney's coastal sewers. However, at present nutrient extraction is only employed within some river systems. Since the Water Board does not accept the role of sewage nutrients in toxic red tides, it is unlikely that nutrient extraction will be introduced to Sydney's coastal sewers in the near future.

The reluctance of the Water Board to introduce secondary treatment or nutrient extraction to its major coastal treatment plants typifies Thomas' criticisms of the Water Board's "long history of 'incrementalism' — where being seen to make some improvement in overcoming a problem has become more important than making a leap in thinking to actually overcome the problem". He points to the progressive attitude of Melbourne Water which, despite a lower operating budget than the Water Board, has provided full secondary treatment for all of Melbourne's sewage that is discharged into the ocean.

The Water Board's management of Sydney's drinking water and wastewater has historically been implemented through a set of isolated systems designed individually to cope with local needs arising from the urban sprawl of the past 100 years. At present the Water Board's Clean Waterways Program is preparing a long-term strategic plan for the management of Sydney's water and wastewater. The program's aim is to integrate Sydney's water supply systems and wastewater treatment plants, and includes a $520 million proposal to treat Sydney's drinking water. (It seems curious that the Water Board can budget for a $520 million program to treat drinking water when the similar cost of introducing secondary treatment of coastal sewage to the North Head or Malabar plants would have brought about a doubling or tripling of water rates.)

Logically, the CWP plan will also commit the Water Board to follow Melbourne's lead in sewage treatment.The debate over whether Sydney's sewage is causing local or widespread damage to the marine environment may be hotly contested by the Water Board, but there is little doubt that incremental improvements to sewage treatment capabilities will not be able to keep pace with the growing demands of expanding urban populations. Regardless of whether or not Sydney's sewers contribute to red tide deaths, there are consequences for the future of the marine environment that must be considered if we are to avoid the levels of marine pollution found elsewhere in the world. If red tides and industrial waste are not a threat then those consequences may be negligible. But what if the opposite is true? ★

RESEARCH PAPER

A P Ablong

A vision of the thinker's tool-kit

Since the dawn of thought, we have relied on insight and investigation (observation) to develop humanity's knowledge base. But within the last decade, technological innovation has produced a quantum leap in our ability to acquire and manipulate input data and information. A P Ablong examines information systems innovations, particularly in databases, data networks and visualisation, and argues that this amounts to a new tool box for the thinker. ►

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MANY different mental activities are called 'thinking'. At one extreme there is the conscious but idle daydreaming that most of us do occasionally. At the other is the unconscious creative thought of the thinker, researcher or artist. Whether thinking activities are seen as concrete or abstract are moot points. However, they all share one important property to ensure that the task being undertaken will have a successful outcome: they require data, information and/or some form of evidence to act as confirmatory 'bias' to support, disconfirm or falsify the issue in question; to evolve satisfactory solutions or discover that there are no satisfactory solutions to the problem at hand; to provide or reinforce the human memory systems with up to date knowledge to enable creativity to occur; and to make decisions under conditions of uncertainty where critical information may be probabilistic, and there is no one single, correct answer – only the best bet.

Therefore, a sound working knowledge of the technological facilities that are available today could offer the promise of scientific breakthroughs. New insights, made possible by such facilities, can offer improved approaches to the conduct of reasoning, problem solving and decision- making, activities which are extremely difficult and unimaginable by other means. In essence, a sophisticated technological tool-kit is available for the thinker to use.

Some of these significant 'external' aids have been, and are continuing to be developed in the information systems discipline, particularly in the specific areas of databases, data networks and visualisation. This article proposes a model for their integration and optimal use by thinkers and researchers to complement the thinking processes associated with reasoning, problem solving and decision-making. Finally, a vision of the impact on the structure and sociology of science relating to the acquisition, conduct and sharing of knowledge in the future is also projected.

The significance of computational science and technology

Throughout history, science has been based on two modes of discovery : theory and experimentation (observation). In this century, these classic modalities have been joined by a third: computation science. This modality involves the use of digital computers to make complex calculations, screen extremely large files of data, and simulate experimental conditions not considered possible with the facilities available in the past.

While different fields of science require computation to play different roles, in the heavily theory-driven fields the major resources are mathematical expressions describing natural situations. By the very nature of these resources, the situations subject to solution are special cases, since the majority of natural situations are far too complex to solve. In these disciplines computation opens a new world of theoretical exploration.

Computational methods, however, can also take other forms in different fields of research. For example, in chemistry, molecular biology, and structural biology, powerful computational modelling can be used to predict structures or to produce computer simulations of macromolecules, modelling potential changes resulting from chemical modification or environmental influences such as solvent or temperature. Such simulations are based on structures resolved from large data files describing crystal structure or other physical measurements of molecular conformation.

In advanced research on molecular biology and increasingly in systematic biology and genetics, computation has become a tool which is applied to massive data handling and intricate string searching algorithms for the analysis of gene sequence data and mapping information.

There can be little doubt that virtually all scientific disciplines have similar needs for some types of computer applications. One of the most significant current applications, which will have broad applicability in many research areas, is the architectural design CADCAM tool kit for computer design in two dimensions. This facility will enable a user to walk through a 'virtual' structure to obtain a sense of what the real structure will involve, and once inside, how it will feel. Moreover, once having moulded the design, the dimensions are automatically registered by the computer and the virtual shape can immediately be translated as printed plans.

The application of such tools to enable scientists to get inside a simulation, for example to walk through a cell and inspect subcellular structures, can provide a whole new interface to data analysis and the management of the huge amount of data which can be applied to these simulations. According to the Institute of Electrical and Electronic Engineers (1991) *in most scientific and engineering disciplines data generation outstrips the ability of scientists*

and engineers to incorporate and access the information, and the vast majority of the data generated is never placed in a broadly accessible form.

Given such a formal directive, it is little wonder that manufacturers of computing equipment and of peripheral technologies have made it their continuing marketing dictum that new instruments and new techniques must drive sales growth, and so the demands on analytical tools continue to grow.

Information and knowledge databases

During the past ten years, increased demands made of computational facilities involved the ability to input, store and search data files. However, there is now a need to use such information and knowledge databases in new and better ways.

In the sciences, understanding is usually based on analogy between systems, and in-depth knowledge of one system is often derived from knowledge of another. For example, it is not widely known that the extensive biology data captured and stored on a number of individual research databases regarding the oncogenesis in birds and rodents provided the basis for discovery of their role in human cancer. In this context the biological databases constitute the windows into the knowledge accumulated about one or more biological systems.

However, as the information in such types of scientific databases has become more complex, the conventional relational database technology is proving to be totally inadequate when required to do more than to serve as a data retrieval and archival system.

Object and image representation is now required and new methods and algorithms are being demanded to allow integration with other technologies, and for searching and comparing these data representations. Future research databases must, therefore, be designed from the conception stage to accommodate the communications between that database and the collection of other related databases of potential relevance to the scientific community.

Data communication networks

Computer networks continue to play an ever greater role in all areas of science as active researchers face a growing need to keep in close contact with their colleagues and to share data, information and knowledge.

Given the current technology that is available, the use of electronic mail systems (e-mail), anonymous file transfer protocol servers, and other established file transfer protocols are meeting some of this need, but even these systems are seen as limited. Current computer research by academics, computer hardware manufacturers and software developers is focusing on a number of significant techniques to expand electronic mail to include digital-analogue bandwidth networking, data compression, graphics, formatted text, equations, spreadsheets, colour, voice and video.

The impact of such technology for researchers will be enormous. For example, many fields of science focus on phenomena that are remote and inaccessible, are inherently distributed across time and space, and are conceptually and computationally complex, and this will expand in the future.

Deep space and deep oceans are examples of remote and inaccessible phenomena. The investigation of the rate and mechanism of global change is an example of phenomena distributed over space and time. The challenge of such networked communication is to bring these phenomena, and others, closer to the researchers associated with the project work, rather than incur significant costs associated with travel from one location to another to take them to the phenomena.

Furthermore, in most cases associated with new dimensions of research work, the research tools are limited. For example, in Australia, there is only one space telescope and not one deep ocean exploration vessel exists, yet many groups of local, national and international researchers require access to the data collection capabilities of these platforms.

A partial solution to such problems was initiated by the National Science Foundation of America in 1988 – an embryonic project called the Collaboratory. This is seen as the logical first step to enhance data communications networks as a medium for collaborative research amongst researchers and scientists on a global basis.

This enhancement of existing data network communications allowed teams of researchers in different parts of the organization to work on a research project simultaneously. Research documentation containing such elements as text, graphics, spread-sheets and photographs can be initiated, reviewed, and held by individuals in different parts of the globe in real-time without the need to travel to the project site.

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Such a facility is still seen as a basic system but it can be easily extended to include other realtime technology such as facsimile, teleconferencing, access to digital libraries, electronic publication and commentary, and other mechanisms for knowledge exchange.

At this stage of computational and network development, the full role of the high-speed research-oriented network in the future development of distributed databases has not been fully assessed. There are already very fast document and data retrieval systems based on the principle that the user interface is built around a personal computer or workstation which is operated as a client from a central server which holds a large data file.

As this concept is extended to the international network system, the rapid accessibility of data will be dramatically changed. This will, of course, introduce a greater need for international cooperation in the development of integrated data files.

Satellite technology will continue to have considerable influence. It will allow users to reach any part of the globe with new types of communication media (e.g., mini telephone/skyphone), and facilities such as the US Department of Defense's Global Positioning System which uses 16 satellites to identify signals from quartz clocks on the nearest four satellites, compare those signals to its own quartz clock, and calculate distance and position for the user.

Videoconferencing, using satellite communication, will allow corporations and private individuals to visually communicate with one another from distant locations. Advances in optic fibre technology will improve facilities on the integrated services digital networks to transmit information in the form of pictures, data and voice messages at the speed of light.

There is little doubt that the future of scientific research includes reliance on large amounts of shared data, yet there has been little planning around this eventuality. Most large shared databases that are currently available for use have

not been developed under a defined national, let alone international, standard for data storage format, retrieval, and secured access.

Because the high-end computational infrastructure will never grow at the rate necessary to satisfy the demand for first-class computational capacity, the role of high-speed networks becomes more significant. High-capacity networking is seen as the only means available to provide remote access to central supercomputer facilities that are not affordable for the majority of institutions and individuals.

The need for simulation makes the strongest demands on computational access, and in a way, is one of the main driving forces for computational science. For example, molecular mechanics has provided first glimpses into the life macro-molecules (e.g. DNA), with the ultimate beauty of seeing for the first time how function and structure truly interrelate. Unfortunately, at this stage, the cost to acquire that insight is prohibitive for most individuals and institutions.

In general, current computer architecture and software are limiting. In most cases, researchers easily use all the time available on either individual or institutional computers and, given practical limitations, are forced to limit CPU time required. Furthermore, the networking infrastructure does not help to promote rapid developments in research because of the growing and widespread access by a variety of users to the computers and software facilities.

Nevertheless, in addition to the many other changes in computer hardware, software and interface systems, by most estimates the next decade will provide an average computing power at both individual desktop and institutional central computers of at least 100 times what is available today. The bandwidth of most national data communication networks will rise by another factor of 1,000 to approximate a gigabyte per second by the year 2001.

Visualisation

Stated simply, visualisation is a set of integrated computer technologies that transform complex data into visual representations, which can dramatically aid researcher's analysis and understanding. Both modelling and experimentation can be successfully achieved by visualisation through graphic and imaging displays.

The use of visualisation techniques on its own has limited value. However, when applied to important scientific issues and problem solving, there is an abundance of evidence to show that even at its simplest level, it can provide an analysis and educational tool without parallel. At the scientific level, experiments and concepts can be realised more definitively and clearly to allow the user to interpret and disseminate new results, and more significantly to visually synthesise new experiments and models.

Existing interactive and interface graphics systems enable the user to gain direct access, at high-speed, to powerful computers for representation and interpretation of massive data files on a variety of subjects such as world weather patterns, global ocean currents and ecosystem perturbations.

The capabilities of such man-machine interactions enables a qualitative leap from batch analysis to interactive processing of intensive calculations and graphical representation. Such a facility can therefore play a critical role in speeding the flow of research by reducing turn-around time from days and weeks to minutes and hours to fit within the time frame for efficient flow of human thought processes that determine the subsequent analysis.

Current visualisation applications fall into three categories, namely:

A. One and two-dimensional graphics and imaging. These relate to straight lines, curved lines, points, and 2D surfaces and geometrics, such as circles, squares, ovals and lines. Applications include classic statistical correlations, signal processing, and two-dimensional plotting, such as bar charts, histograms, and 2D surfaces.

B. Two and three-dimensional visualisation. These relate to images from LANDsats, interplanetary satellites, telemetry devices in particle accelerators, data obtained from laboratory instruments, such as CAT scanners, x-rays, mass spectrometers, and nuclear magnetic resonance imaging. Visualisation primitives include 2D convolutions, 2D modelling, and 3D contour and surface plots. Applications include image processing, feature extraction, data analysis, mapping and remote sensing.

C. Three and four-dimensional visualisation. These techniques model objects such as molecules using 3D geometries (e.g. a sphere instead of a circle), render them (i.e., draw them realistically with correct lighting, shading, texturing), and depict them either as surfaces or volumes. Volumetric visualisation can show the internal details of solid objects, such as cross-sections of mechanical devices or the

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human anatomy. In four-dimensional visualisation, another factor, time, is added. Animated images demonstrate, pictorially, movement and the changes which occur to an object over time. These techniques are typically used in simulation, modelling, rendering, volumetric rendering and animation.

Future visualisation applications will certainly include holography, creating truly three-dimensional images by combining photographic techniques and light with computer technology, and virtual realities, combining visual images with kinetic senses such as movement and touch.

Given all this, the communication rate to and from a central computer will still be the key component for using a graphic or imaging interactive mode for the most demanding simulations.

Typically, the interactive session will drive the submission of computationally-intensive work from an individual's terminal or personal computer at a local site to the central computer, furnishing the current state of the model as data for that computation. Results from the computation will then be transferred back to the local site, providing updated information for the working model and initiating the next round of local graphical interaction.

It is anticipated that such facilities will be available on most networks by the turn of the century so that results on the order of no less than one megabit can be transmitted within a minute on 56 kb per second data links.

The 'tool-kit' of the future

There is no doubt that the complexity of scientific information will increase in the years ahead. Even given today's technological tools, individual researchers are finding that they are less and less able to access and process the information they need. To meet this deteriorating situation, the thinker's tool-kit will need to change and incorporate some of the facilities as shown in Figure 1.

The centrepiece will be the user node in which an electronic laboratory notebook configured similar to a laptop computer (or even smaller) will provide the user with a mobile facility and could contain software and experimental details in a relational data structure, and such data as images of empirical results stored as digitised images in files that can be manipulated and directly compared following computer scaling.

This same electronic notebook will be able to interact with a high-bandwidth research network which will provide access to other researchers through electronic mail, compound document transfer and direct file access. Moreover, the notebook will also contain information about access to data not necessarily in the notebook at the local site, but rather in a database on a remote computer accessible through the network.

The notebook will be the input/output communication nexus and provide the researcher with information for initiating global database searches or scientific computations. The researcher can select any CPU on the basis of availability on the distributed computing network, or suitability based on computing power, available applications software and database. Such functionality would provide any researcher at any location access to a global collaborative laboratory.

Impact on existing philosophy

As we enter the twenty first century with existing technology tools and the determination to develop new technologies to advance collaboration among researchers, the concept of the collaborative laboratory is becoming more of a necessity than an item on a wish-list. The term 'collaboratory' was coined to connote an electronic analog of a physical scientist's wet laboratory: a place in which people interact with instrumentation, with data, with journals and books, but most importantly with each other. Except that it's not a place, it's a distributed electronic environment (Wulf 1990:2-4)

The benefits that can be gained from establishing a collaboratory have been alluded to when discussing particular functionality issues. The general nature of the operational framework with some of the existing technological components have been described. Because the technology is evolving at such magnitude, it is doubtful if a final precise blue-print of the components of a collaboratory can be defined. Hence, by virtue of its existence, it will continue to provide a rich research context for both technology and the social sciences. Once established, a collaboratory will have a profound effect on research and education.

The technical challenges posed by the collaboratory paradigm will be numerous and fascinating. Some of the research required to initiate a first step will be simply system architecture and integration of such existing technologies as electronic mail, file transfer, and traditional databases that are dependent on the kind and scope of use. Other emerging technologies that can be added on are improved data gathering and multimedia mail, multimedia

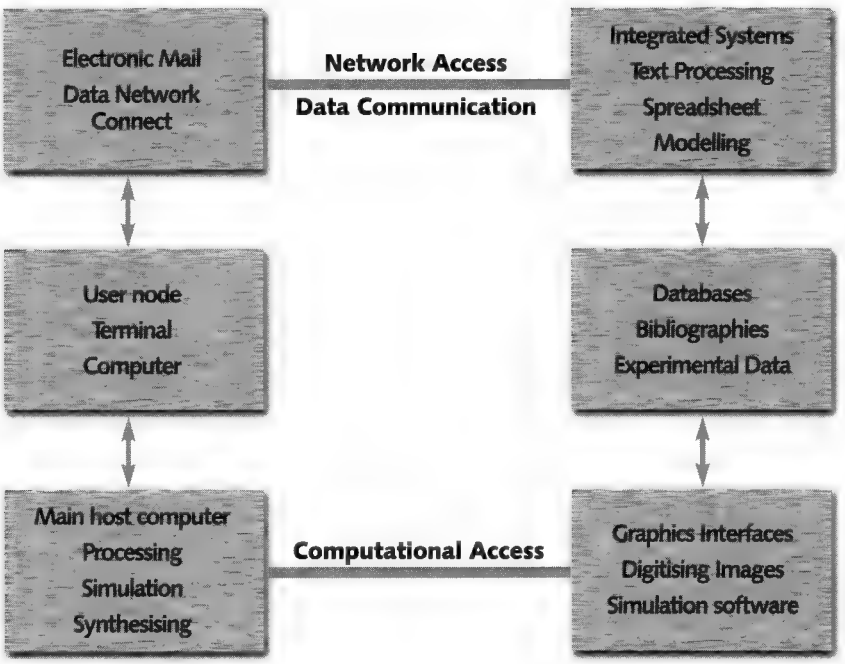

Figure 1: The researcher's collaboratory tool-kit

teleconferencing, structured interaction support and a national file system. The challenge will be to guide the development so that new technologies can be integrated into the collaboratory environment.

These changes are going to have a significant impact on the structure and sociology of academic science in particular. They will establish a sound and functional operational research framework which will change the nature of scientific research design. In the future, more than ever before, academic departments will be forced to deal with faculty with multiple contributions to a digital library or international database but few refereed publications, or with theoreticians who have multiple publications, but who have never done a laboratory experiment.

For scientific research in general this future suggests exciting and rapid progress where the rate of discovery will be increased through better access to information basic to understanding natural phenomena.

These new technologies will not only play a key role in changing our behavioral patterns but also have far ranging effects on every aspect of our life. The structure and control of organisations and work activities will take on a new meaning. Corporations will become more flexible and workers will work from home with electronic access to computation facilities, services and support. This will ease the current concentration of population and industry and improve the quality of life.

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Conclusion

Information technology will continue to play an increasingly important role in the thinking process. Computation, through the integration of data bases, networks and visualisation, will support the traditional two modes of discovery – theory and experimentation – and deal with the increasing complexity and abundance of information. Operational changes in the research and work environment will result, and these will have a significant impact on the structure and sociology of science.

For thinkers, researchers and decision makers, the future suggests exciting rapid progress where the rate of new discovery will be increased through better access to information basic to understanding the natural phenomena. The payoff to those who accept the propositions outlined will be very, very large, offering problem-solving unimaginable by other means. ★

References

Ablong, A.P. (1991) *Australia as an information society: Grasping new paradigms*, submission to House of Representatives Standing Committee for Long Term Strategies, May, ISBN 0 644 14371 1

IEEE (1991) *10th Annual International Phoenix Conference on computers and communications*, Proceedings, Institute of Electrical and Electronic Engineers, March, ISBN 0-8186-2133-8

Wulf, W.A. (1990) *Towards a National Collaboratory*, EDU, Spring, Issue 53 pp.2-4

Body building: Darryl Ribaux is a Melbourne based writer. His last two articles in **21C** have been about electronic books and computer pornography and censorship.

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